United States Patent [19]

Diamond

[11] **Patent Number: 4,542,853**

[45] **Date of Patent: Sep. 24, 1985**

[54] **FLUID VALVE WITH DIRECTIONAL OUTLET JET OF CONTINUOUSLY CHANGING DIRECTION**

[76] Inventor: **Harvey E. Diamond,** 12952 Woodridge St., Studio City, Calif. 91604

[21] Appl. No.: **572,702**

[22] Filed: **Jan. 20, 1984**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 457,961, Jan. 14, 1983, abandoned, which is a continuation-in-part of Ser. No. 218,487, Dec. 22, 1980, abandoned.

[51] **Int. Cl.**[4] **B05B 3/16;** B05B 7/00

[52] **U.S. Cl.** **239/383;** 239/428.5; 239/DIG. 16

[58] **Field of Search** .... 239/380-383, 239/428.5, DIG. 16, 206; 4/492, 542, 569

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,778,620 1/1957 Goodrie 239/428.5

2,974,877 3/1961 Hruby, Jr. .... 239/DIG. 16 X

FOREIGN PATENT DOCUMENTS

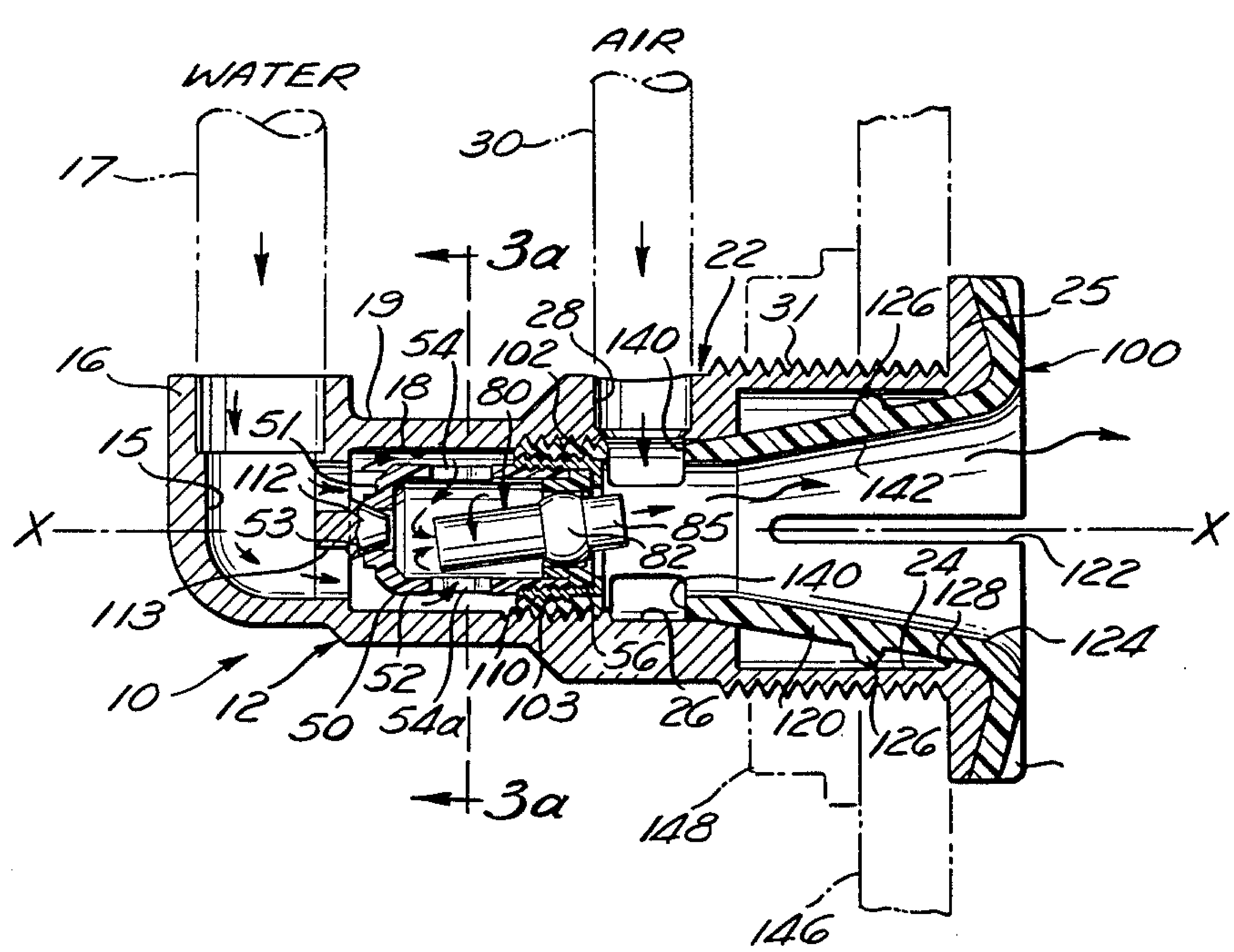
43095 4/1960 Poland 239/428.5

Primary Examiner—Andres Kashnikow
Attorney, Agent, or Firm—I. Morley Drucker

[57] **ABSTRACT**

A fluid-flow valve or nozzle discharging a stream of continuously changing direction, particularly for use as a shower head or for use in hydrotherapy to discharge a fluid stream or a turbulent jet of an intimate water-air admixture, respectively, the preferably adjustable discharge pattern covering a conical or annular surface of revolution, or variations thereof. The valve or nozzle comprises a body, a moveable rotor chamber coaxially mounted within the valve body, and a rotor body within the rotor chamber. Water and air are fed to inlets and to pass through the bore of the moving rotor body, and discharged through a flared mouth where a control knob can be rotated to influence the fluid flows and the motion of the rotor body.

50 Claims, 24 Drawing Figures



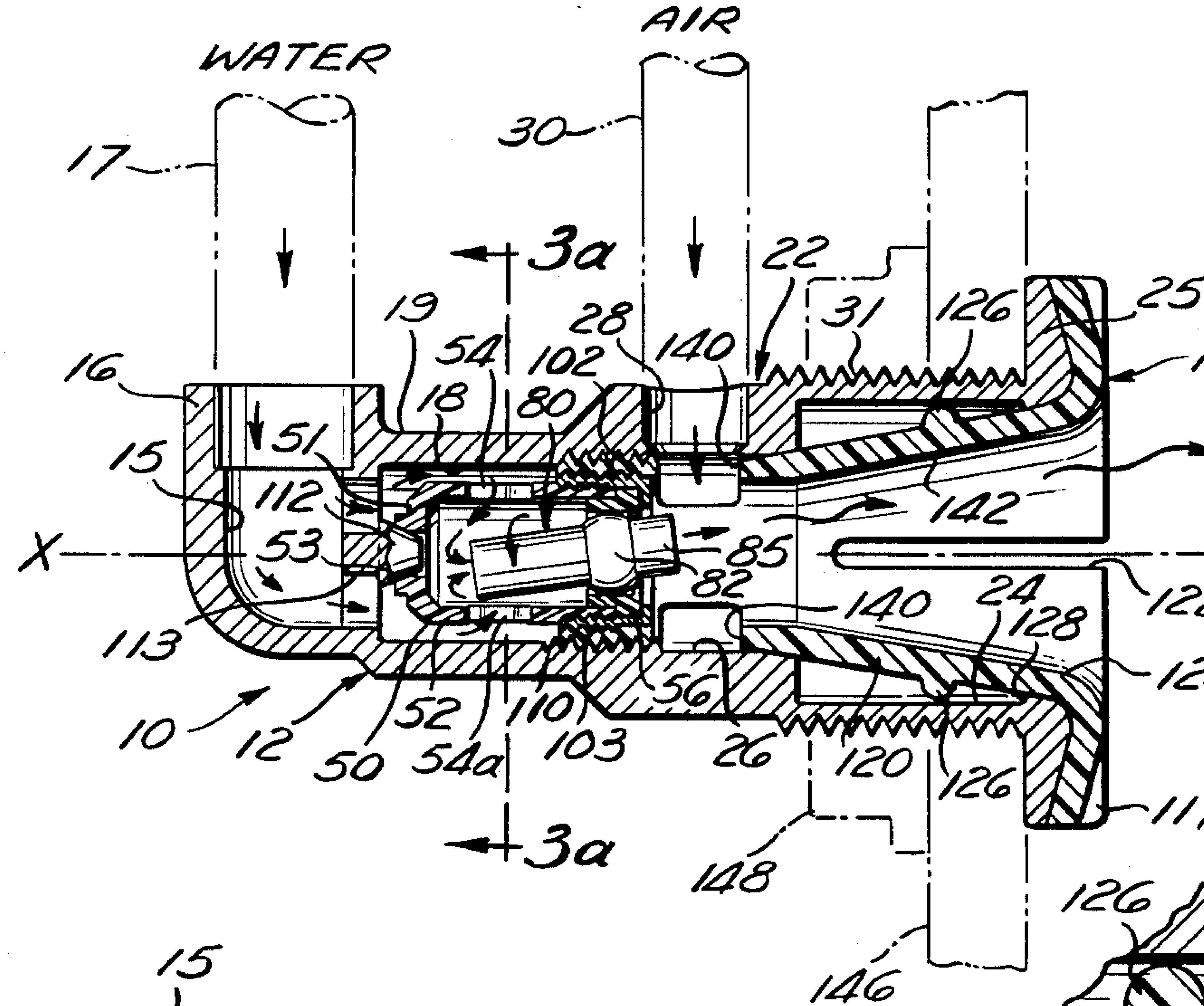


Fig. 1

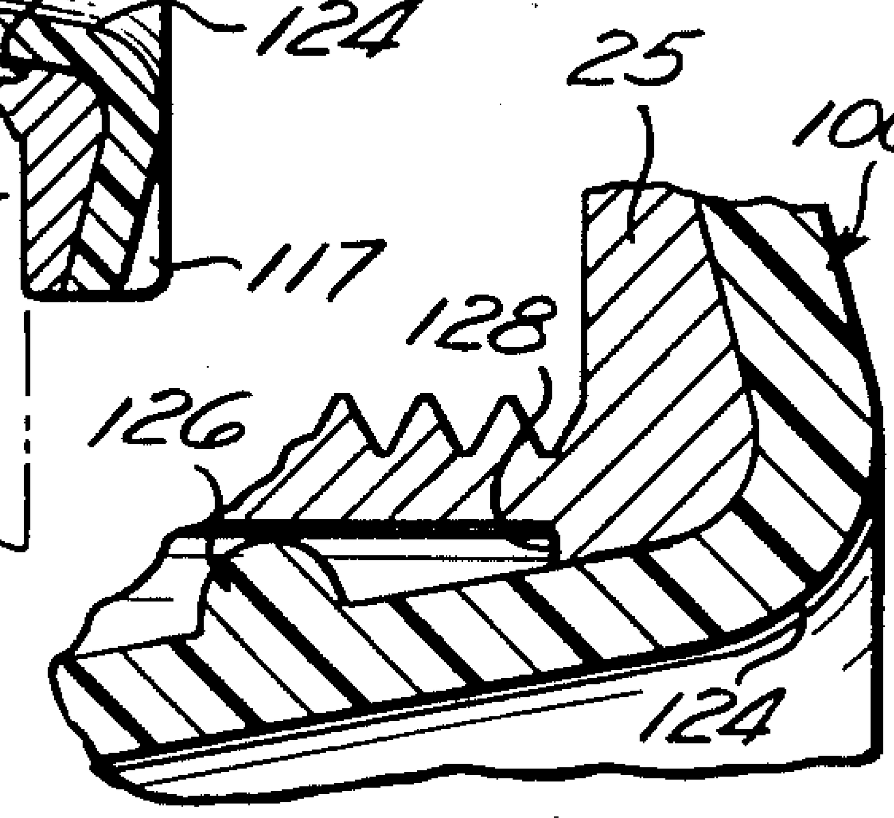


Fig. 1a

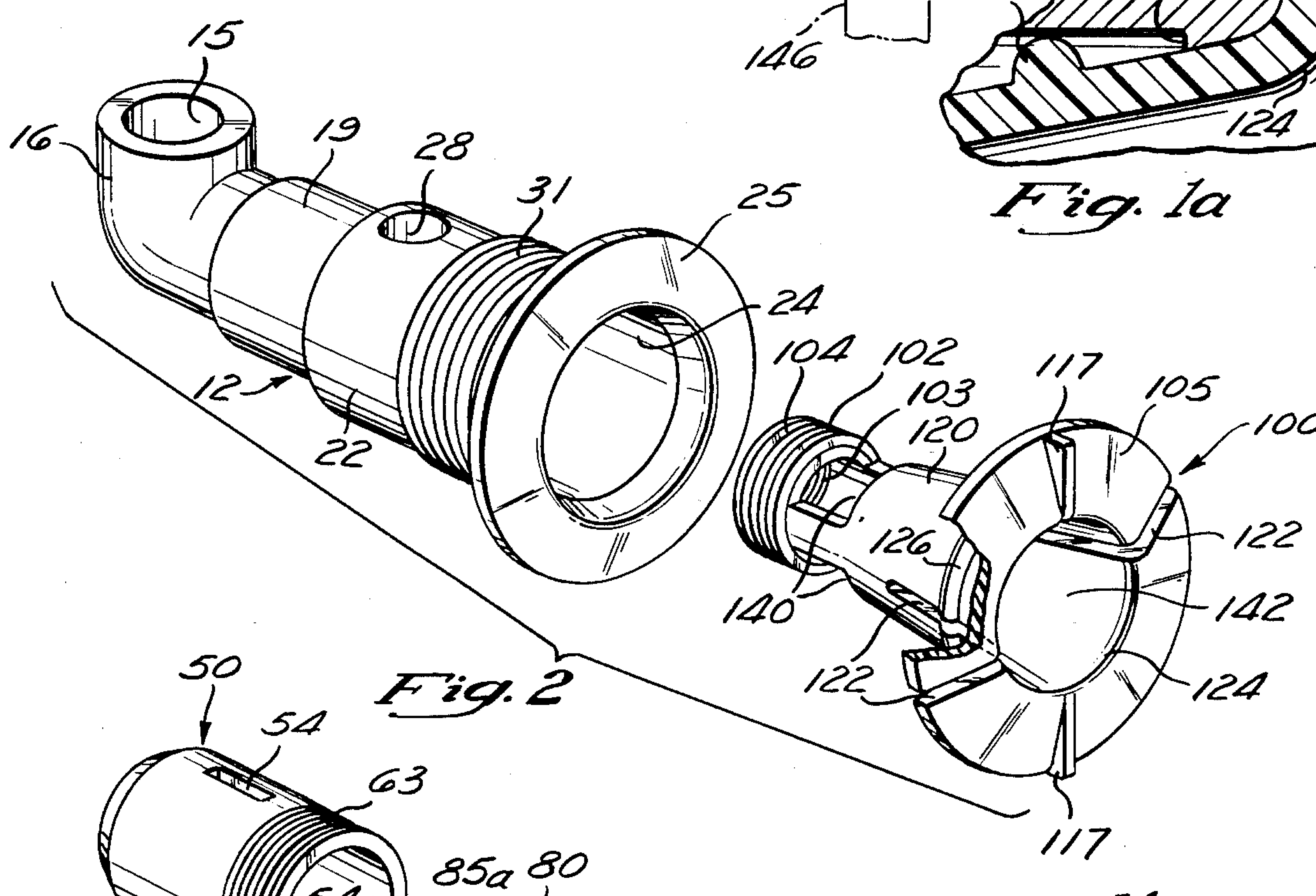


Fig. 2

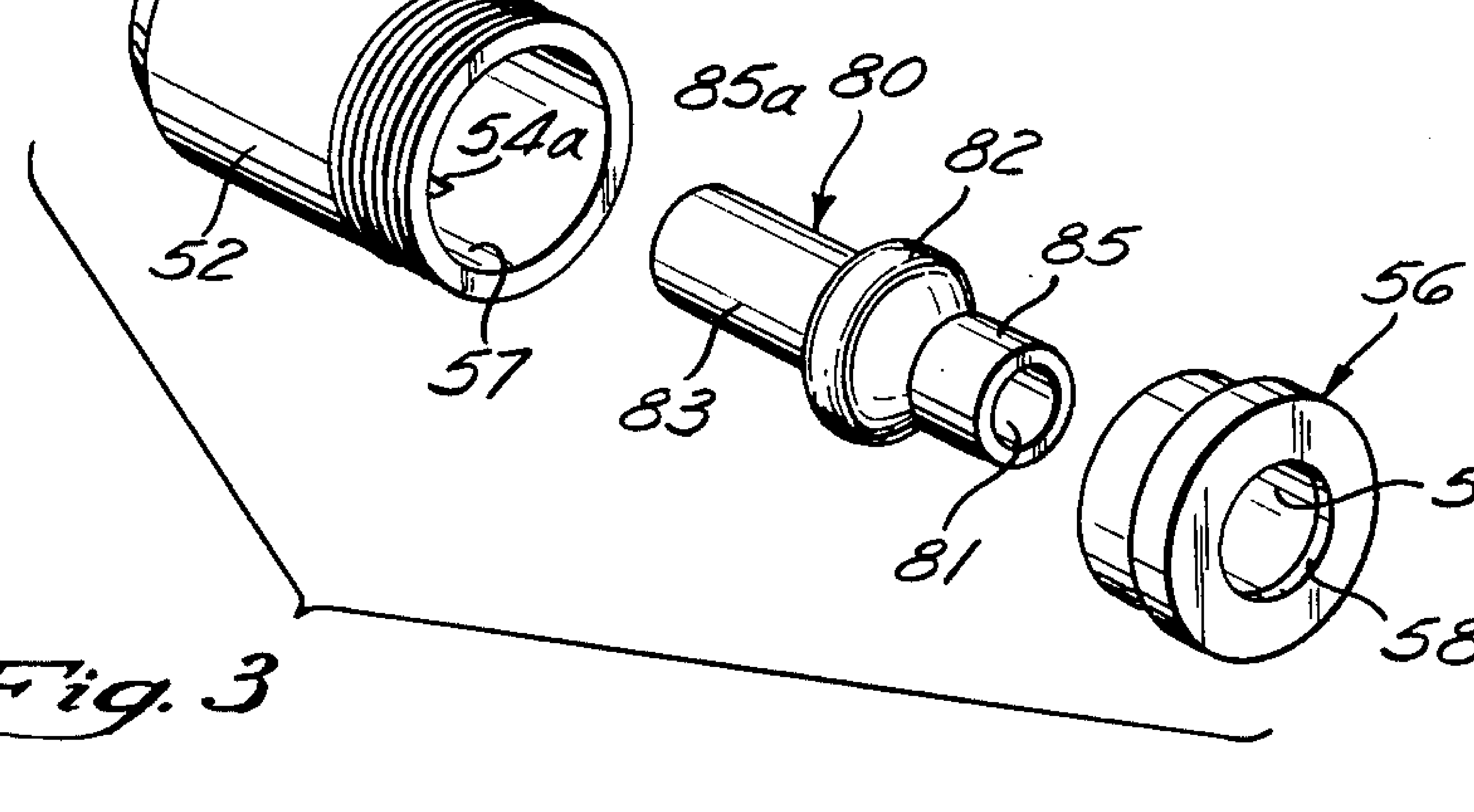


Fig. 3

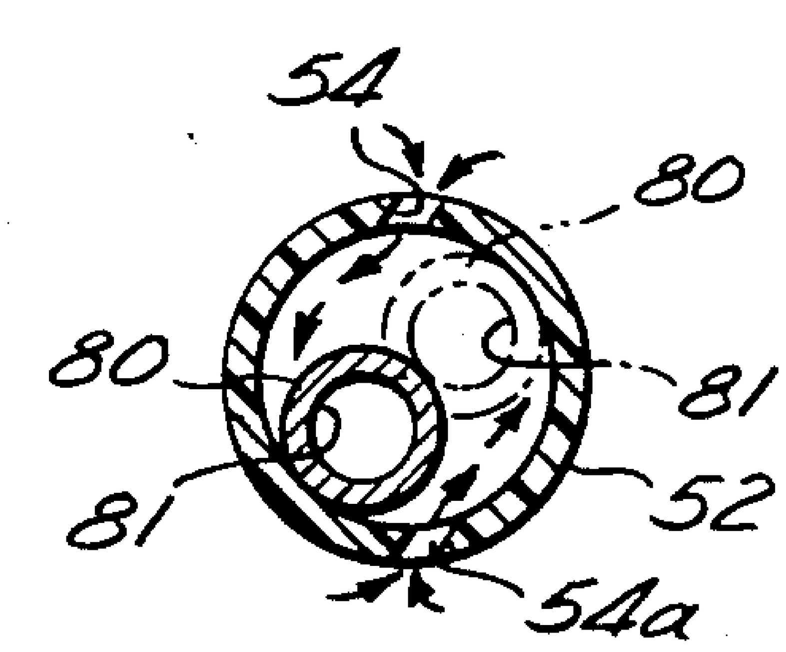


Fig. 3a

Fig. 4

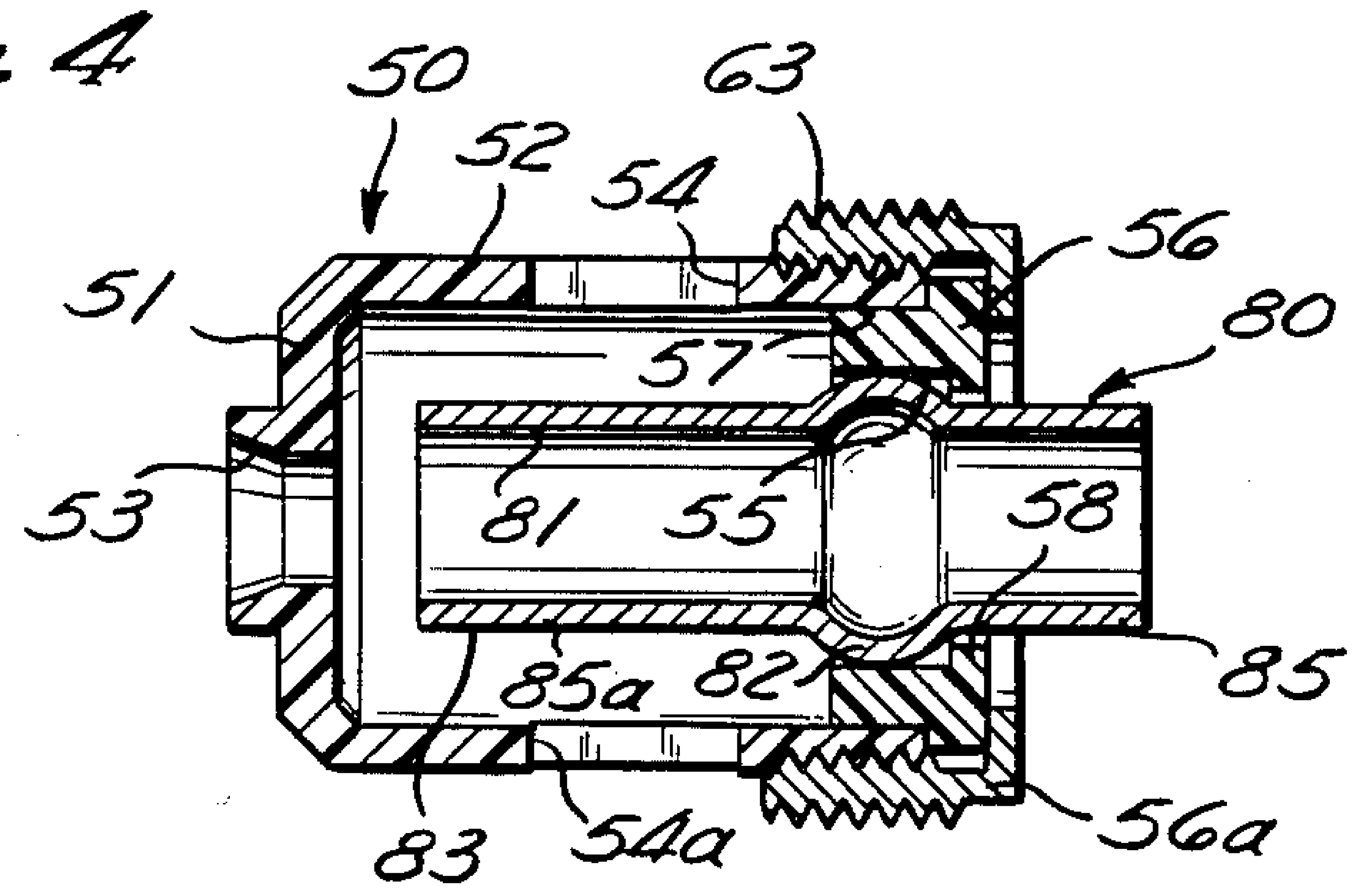
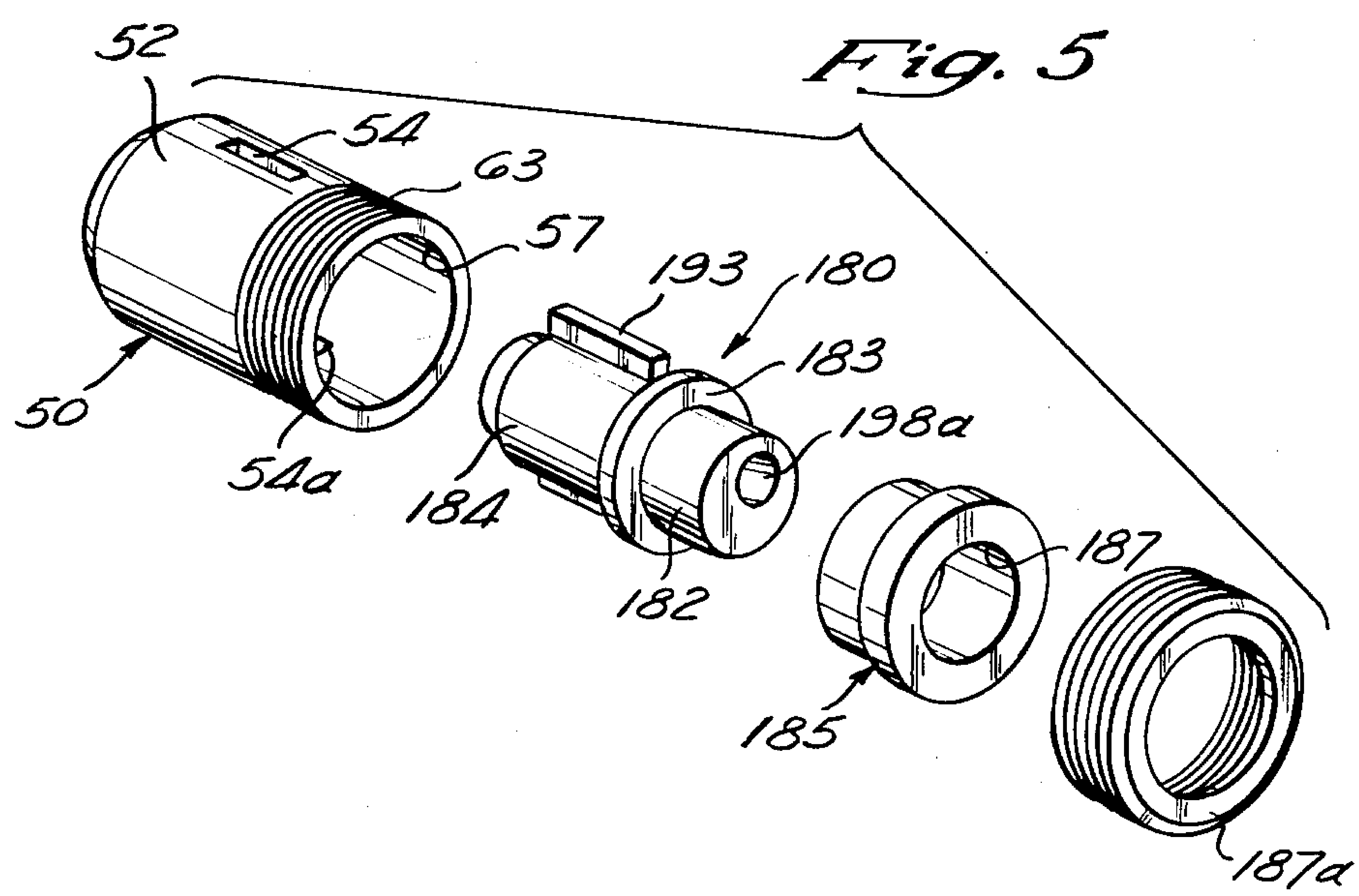


Fig. 5



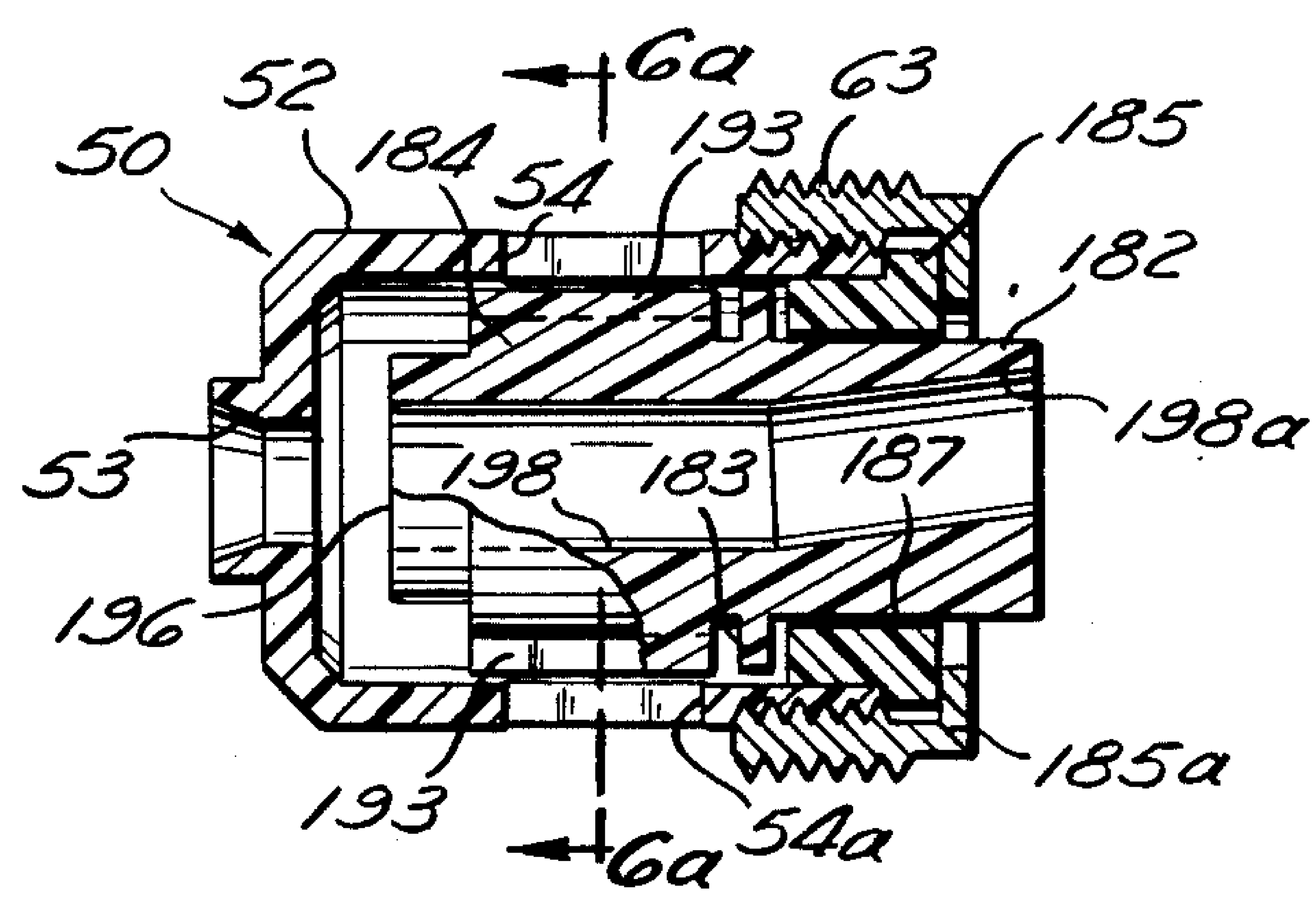


Fig. 6

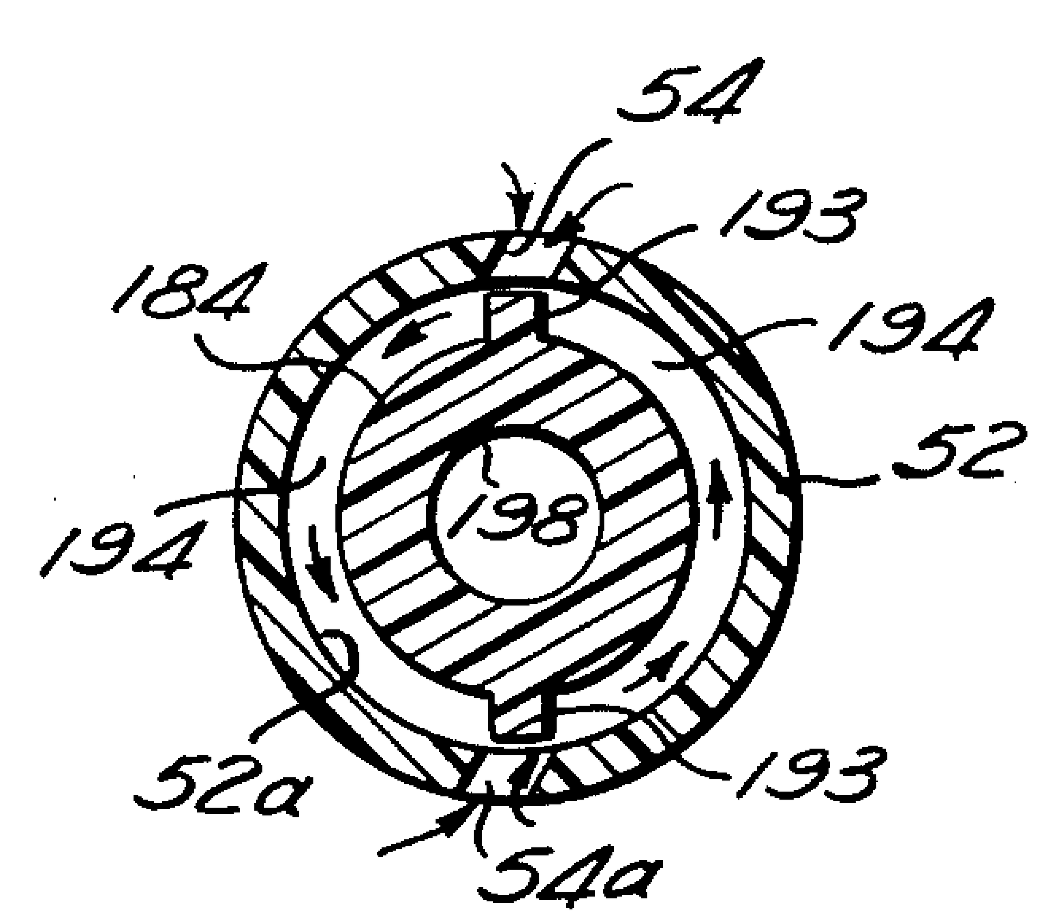
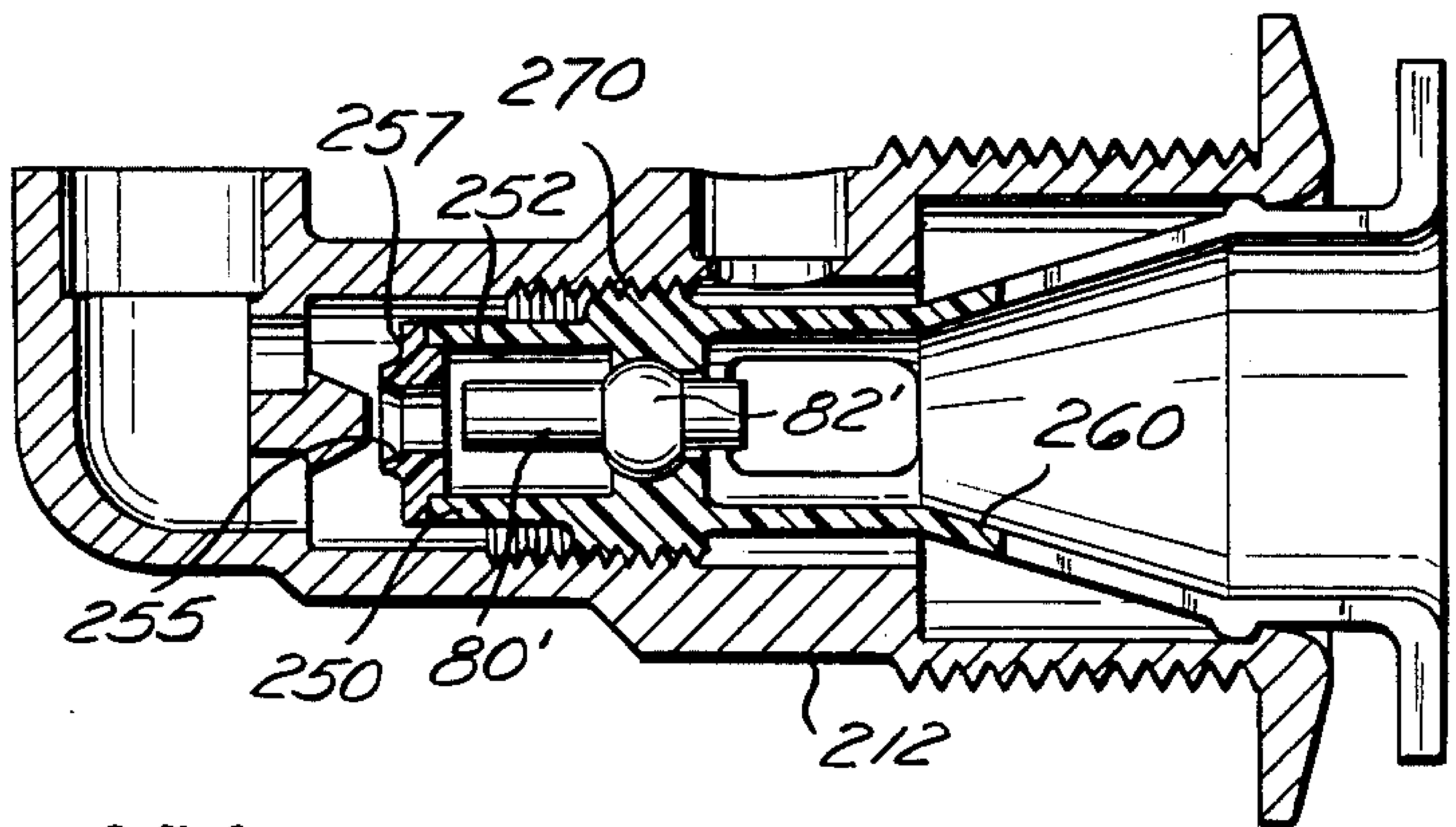


Fig. 6a

Fig. 9



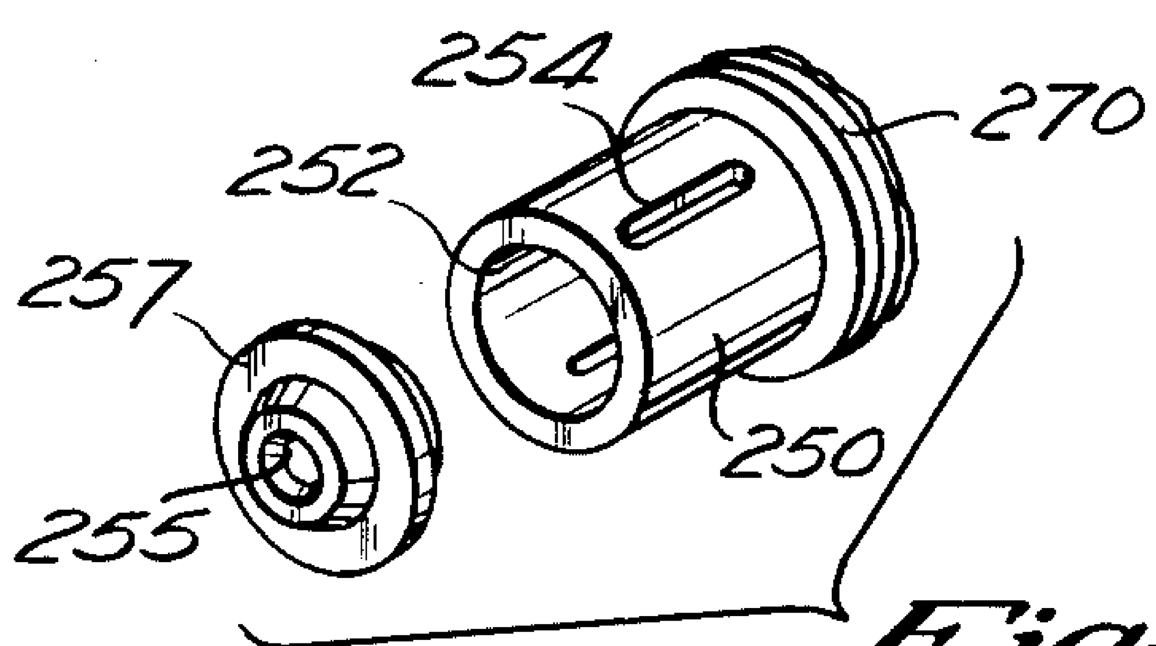


Fig. 10

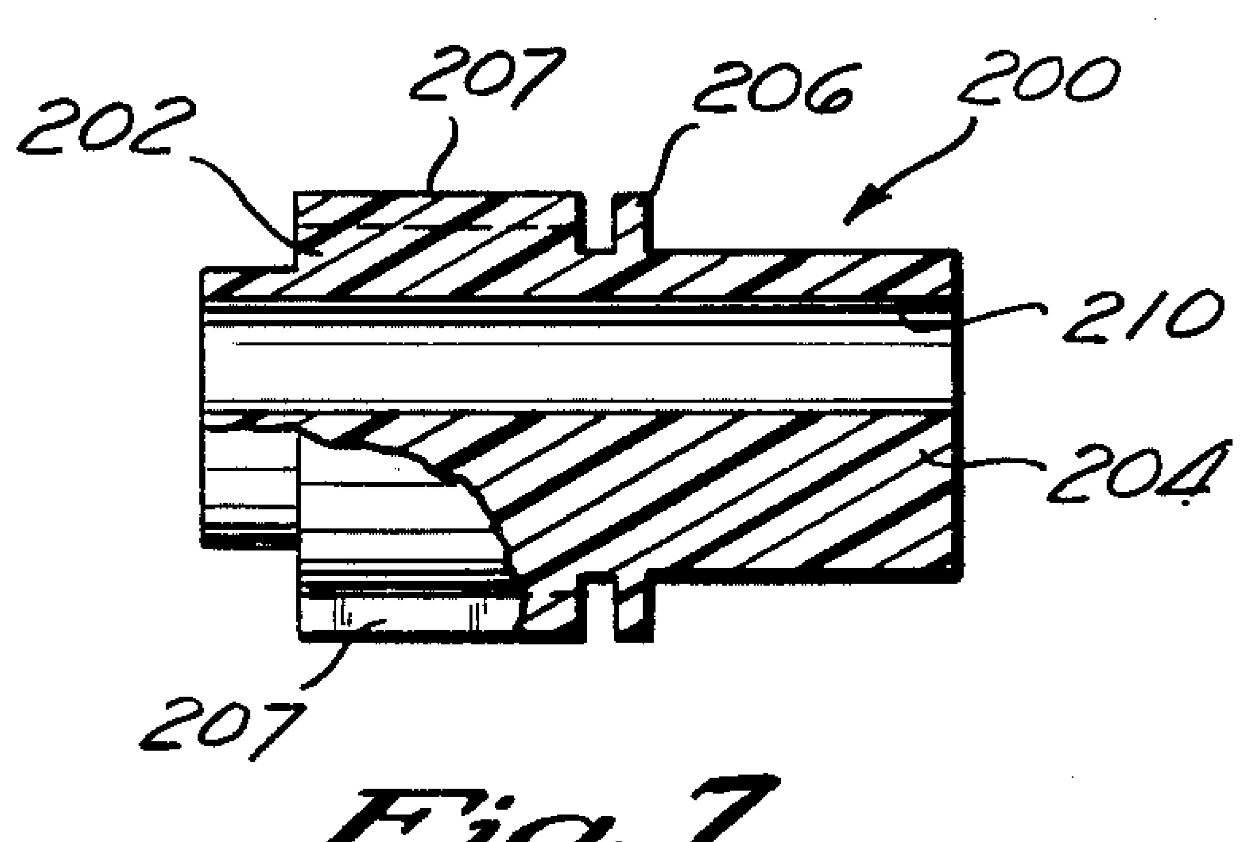


Fig. 7

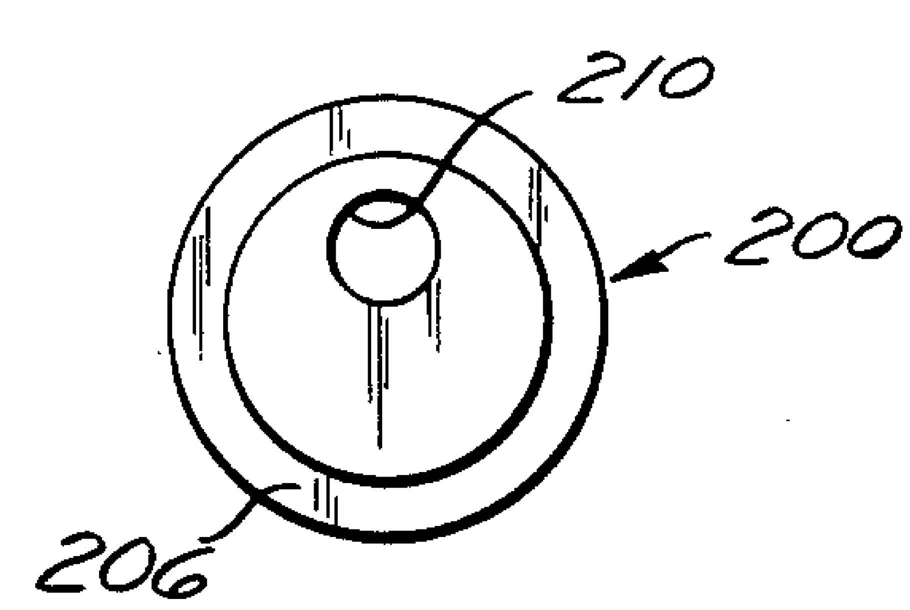
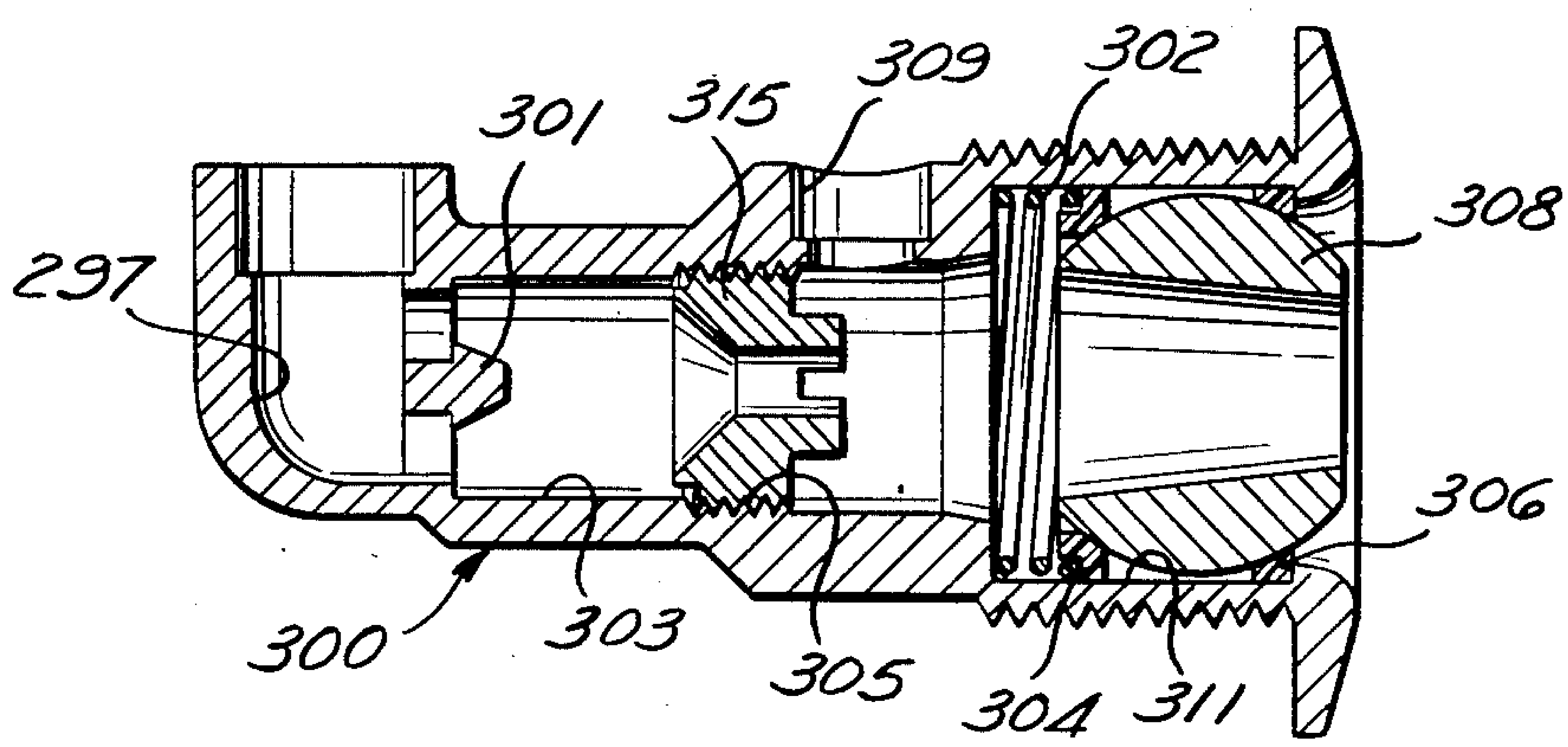


Fig. 8

Fig. 11



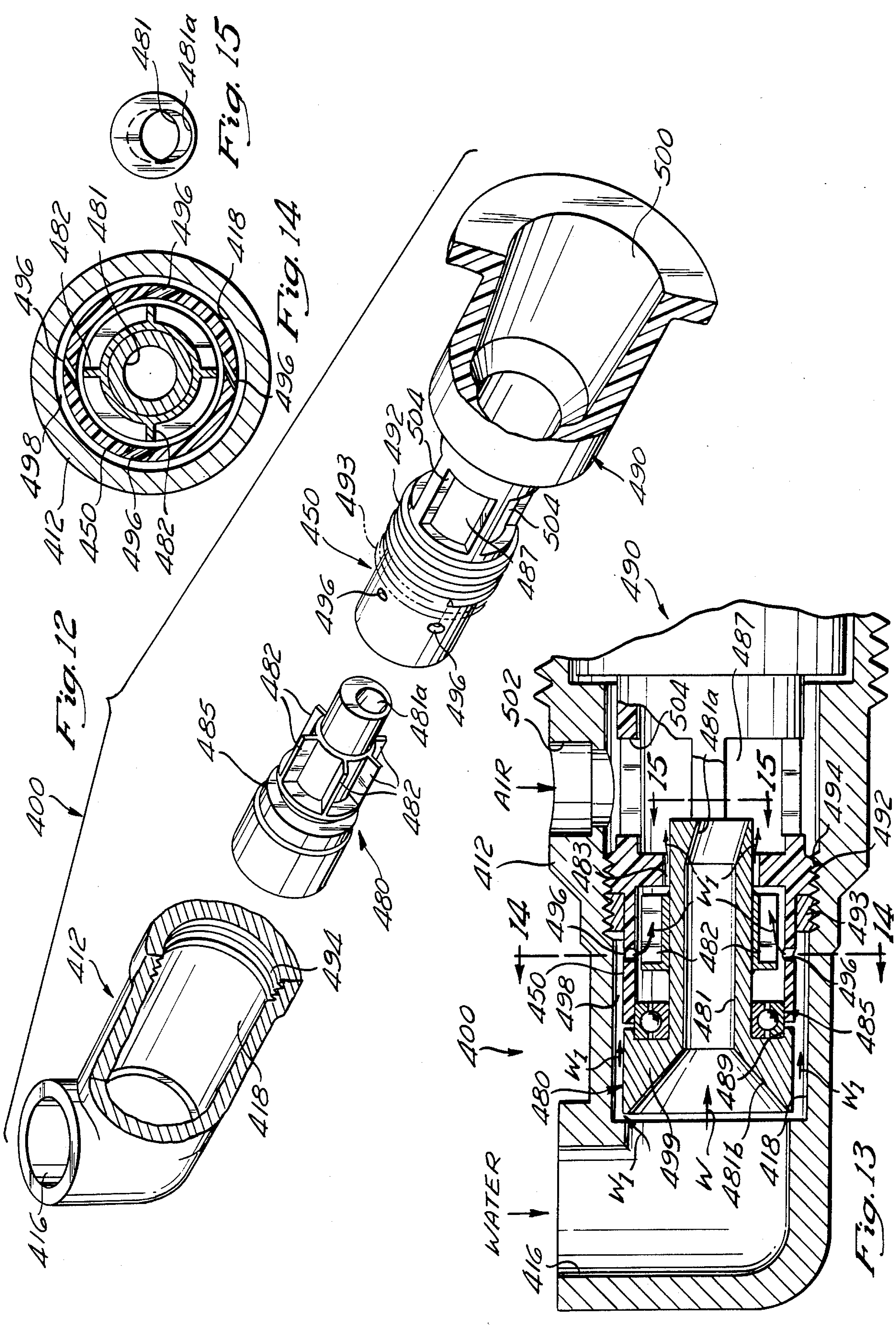


Fig. 12
Fig. 13
Fig. 14
Fig. 15
AIR
WATER

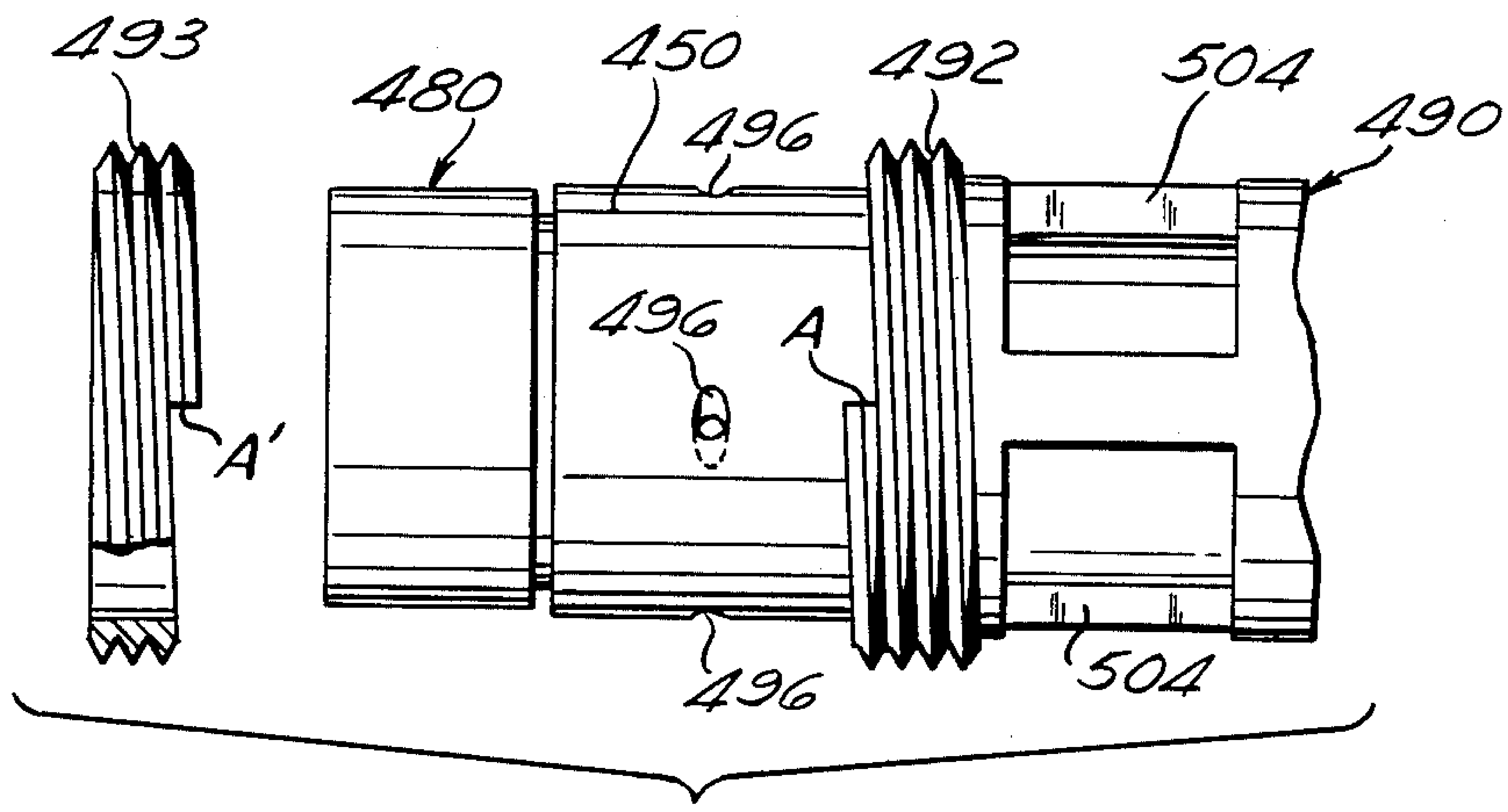

493
480
450
496
492
504
490
496
A
A'
496
504

Fig. 16

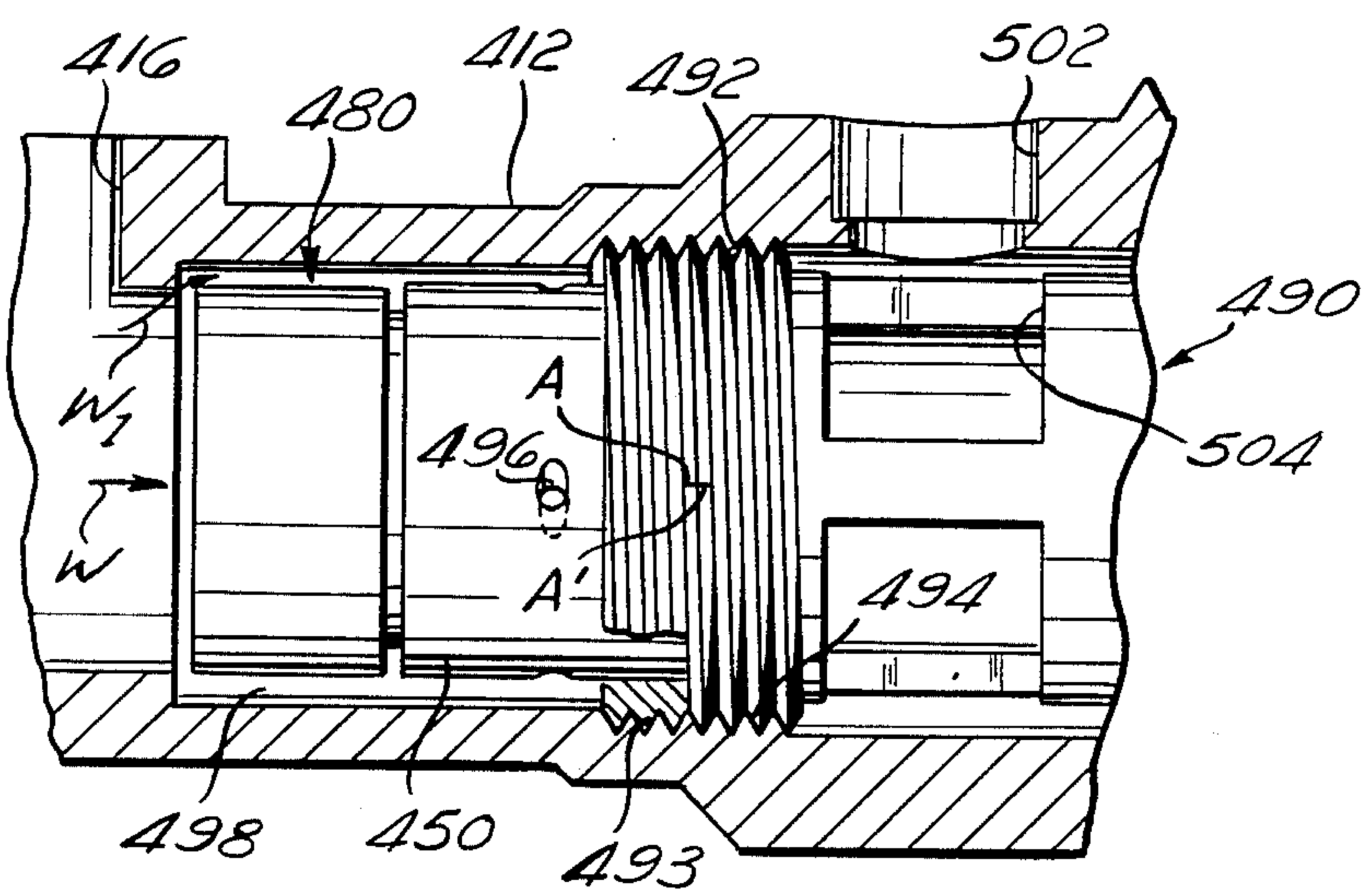

416
412
480
492
502
490
W_1
A
496
504
W
A'
494
498
450
493

Fig. 17

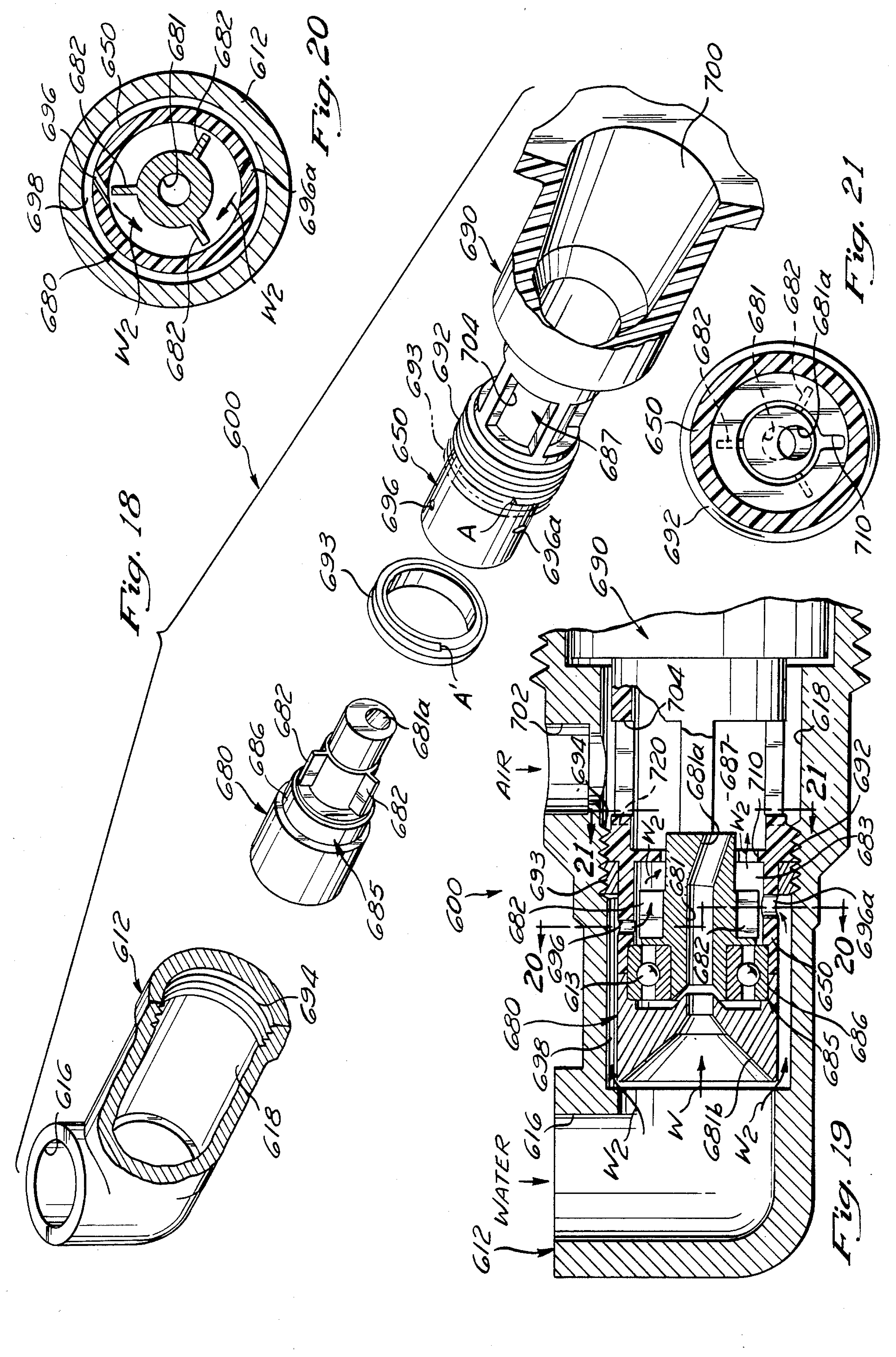


Fig. 18
Fig. 19
Fig. 20
Fig. 21
600
612
616
618
694
680
686
682
681a
685
693
A'
650
696
696a
A
692
704
687
690
700
698
681
W2
AIR
702
720
W2
710
21
683
20
613
681b
W
WATER
650
692
710

FLUID VALVE WITH DIRECTIONAL OUTLET JET OF CONTINUOUSLY CHANGING DIRECTION

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of application Ser. No. 457,961, filed Jan. 14, 1983 entitled "IMPROVEMENTS IN A FLUID VALVE WITH DIRECTIONAL OUTLET JET", which said application being, in turn, a continuation-in-part of application Ser. No. 218,487, filed Dec. 22, 1980 and entitled "A FLUID VALVE WITH DIRECTIONAL OUTLET JET OF CONTINUOUSLY CHANGING DIRECTION", both now abandoned.

BACKGROUND OF THE INVENTION

This invention lies in the field of fluid valves and discharge nozzles and more particularly pertains to fluid discharge nozzles wherein a particular discharge pattern, having an automatic continuously changing direction, is desired. The fluid discharge nozzles have particular application in hydrotherapy and are adapted to discharge a turbulent air-water admixture for this purpose.

Fluid valves and discharge nozzles of the prior art include units having manually directionally adjustable outlets such as is disclosed in applicant's U.S. Pat. No. 4,221,336 entitled "NOZZLE WITH DIRECTIONALLY VARIABLE OUTLET" issued on Sept. 9, 1980.

The applicant wishes to make of record the following prior art:

PATENTEE	PATENT NO.
Walter C. Lorenzen	3,677,474
Alfred M. Moen	3,997,116
Wayne D. Steimle	3,985,303
J. H. McElroy	1,056,811

Each of the foregoing patents shows directionally adjustable outlets for water, or water-air admixtures. However, each of the outlet nozzles are manually adjustable. The outlet nozzles of the present invention teach the formation of an outlet jet of fluid of automatically continuously changing direction, the direction changing in accordance with a predetermined flow pattern, e.g., annular or conical.

The following prior art should also be noted:

PATENTEE	PATENT NO.
Larry P. Meyer	4,073,438
John H. Drew et al.	3,791,584
Mark Healy	3,627,205
Gerald Tokar	3,608,828
J. O. Hruby, Jr.	2,974,877
British	2,046,129
British	1,250,363
British	1,119,192
J. O. Hruby, Jr.	2,639,191
M. C. Aubert	3,091,400
J. O. Hruby, Jr.	3,357,643
German	719,424

The Meyer and Drew patents are the closest prior art presently known to the applicant. These patents relate to a sprinkler or shower head having means for automatically orbiting (or gyrating) and rotating a discharge nozzle, under the influence of water pressure. The structure of the Meyer and Drew patents are such as to impart to the discharge nozzle both an oscillating (or gyrating) movement and a rotational movement and would not appear to be suitable in a whirlpool bath environment. The structure of the applicant's invention provides a different and a more readily adjustable, pattern of water discharge than Meyer or Drew, and one that is much more suitable for hydrotherapy than Meyer or Drew.

It is a major object of the novel valve disclosed herein to produce a discharge jet of water and air which continuously generates a conical or annular surface of revolution or variations thereof in a simple and reproducible manner, and which discharge pattern may be readily varied. It is a further object to produce any of the foregoing discharge patterns, with water alone, or an intimate admixture of air and water, or other fluids.

The fluid valve of this invention is therefore capable of continuous therapeutic massaging action over a much wider range of action than the directionally static jets of the prior art, or other discharge nozzles of the prior art.

SUMMARY OF THE INVENTION

This invention is directed towards a fluid valve or nozzle for discharging a directional outlet fluid jet of continuously changing direction, automatically, and in a repetitive, reproducible pattern. The fluid valve pertains, in particular, to fluid discharge nozzles for use in hydrotherapy, wherein air is intimately admixed with the effluent liquid (water) stream, to create a turbulent air-water directional outlet stream of continuously changing direction, although the fluid valve may also be used as a shower head, i.e., outside of a whirlpool bath environment

The valve of this invention comprises a main valve body having a first fluid inlet means, a first fluid outlet means, and a preferably, generally cylindrical valve bore interposed between, and in communication with, the first fluid inlet and outlet means. Mounted, in as frictionless a manner as possible, within the said main valve body, is a cylindrical housing or hollow rotor chamber. The cylindrical rotor chamber is provided with a centrally apertured end wall on the inlet or upstream side of the valve. This rotor chamber is of smaller diameter than the valve bore diameter and is mounted coaxially therewith whereby the cylindrical wall of the chamber is spaced from the valve bore inner wall surface. The cylindrical wall of the rotor chamber contains one or more radially outer apertures which function as radially offset fluid inlet port means. The rotor chamber is preferably movable along the longitudinal axis of the valve bore to a number of multiple, different, positions. In one embodiment, in one extreme of such multiple positions, the central aperture of the end wall of the rotor chamber, on the inlet or upstream side, is closed by a plug, centrally mounted in the inlet side of the valve bore and in the opposed extreme position, the central inlet aperture in the rotor chamber end wall is completely open. Intermediate positions, between these extremes, cause various degrees of closure of the central inlet aperture of the rotor chamber. In this way, fluid in a fluid stream entering the valve bore from the first fluid inlet means is divided, in its travel, between the central inlet aperture of the rotor chamber, and the radially offset inlet ports of the rotor chamber, in a predetermined, readily adjustable, manner. In another presently preferred embodiment, various degrees of closure of the radially offset inlet ports to the rotor chamber is provided, by movement of the rotor chamber without closing off the central, or main, water inlet to the rotor chamber.

An elongated tubular, rotor body is mounted within rotor chamber, the rotor body having a rotor bore extending therethrough. The rotor body is mounted, within the rotor chamber, for either rotational motion or rotational rocking movement, about the longitudinal axis of the valve bore, the type of mounting depending upon the location of the rotor bore within the rotor body.

In operation, the rotor chamber is positioned within, and along the longitudinal axis of the valve bore in a predetermined manner, by means of either an internally or externally operable control knob. Fluid flow is initiated, and the fluid is divided between the central inlet aperture of the rotor chamber and the radially offset inlet ports of the rotor chamber in a preset proportion depending upon the axial setting of the rotor chamber. The fluid passing through the radially offset fluid inlet ports of the rotor chamber exerts force on the rotor body wall exterior and initiates both rotatory and up-down (rocking) movement of the rotor body, or purely rotational movement, depending upon the type of mounting provided for the rotor body. Thus, if the rotor bore is coaxially positioned within the rotor body, the rotor body is mounted for both rocking and rotational movement. Fluid pressure exerted, tangentially, on the exterior wall of the rotor body by means of fluid flow from the radially offset inlet ports, will then cause continuous rocking and rotational motion of the rotor body and initiates continuous, repetitive, angular displacement of the rotor bore with respect to the longitudinal axis of the valve bore. The effluent fluid will exit in the form of a directional jet of continuously changing direction extending between fixed preset limits dictated by the extent of the rocking movement of the rotor body.

When the rotor body is mounted, for pure rotary movement, within the rotor chamber, the radially outer fluid inlet ports in said rotary chamber are positioned so as to direct the inlet fluid sream, tangentially, onto the rotor body wall surface, in a continuous manner, and cause rotation thereof. In this case, the rotor bore will be either wholly or partially eccentric with respect to the longitudinal axis of the valve bore, or will be parallel but radially offset with respect to said longitudinal axis. The flow of fluid, resulting from flow through the continously rotating eccentric rotor bore is a directional fluid jet of continuously changing direction extending over a conical surface of revolution while the directional fluid jet exiting from the continuously rotating radially offset but parallel bore, takes the form of an annular stream of water.

The velocity of the exiting directional streams or jets of fluid is readily adjustable by increasing or decreasing the fluid flow through the radial outer inlet ports. Adjustment may be made by externally operable control members or by otherwise internally adjusting the rotor chamber position. The effluent fluid stream may be further admixed, with air, to form an intimate, turbulent, air-water admixture for use in hydrotherapy "whirlpool" baths, or may be used as an effluent for shower heads and the like.

In the presently preferred embodiment, the rotor body is mounted, by wholly concealed ball-bearings, within the valve bore to provide as frictionless and contamination-free a mounting as possible thereby leading to an efficient, reliable and reproducible automically and continuously changing discharge pattern, even at very low levels of inlet water pressure, and which discharge pattern may be readily varied by simple, externally located or internal, control means.

The fluid valve of this invention is simple to manufacture and reliable in operation. It requires only a small number of parts, i.e., the valve body, the longitudinally adjustable cylindrical rotor chamber mounted therewithin, and the tubular rotor body mounted for movement, either rotary or rocking, within the rotor chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a longitudinal cross section of a first embodiment of my fluid valve, the fluid and air inlet conduits and valve mounting shown in phanton;

FIG. **1***a* is a enlarged detail of FIG. **1** showing within the arcuate arrow **1***a* the detent means of the adjusting member at the valve bore outlet;

FIG. **2** is an exploded perspective view of the valve body and adjusting member of FIG. **1**;

FIG. **3** is an exploded perspective view of the rotor body and chamber therefor of FIG. **1**;

FIG. **3***a* is a cross section taken along line **3***a*—**3***a* of FIG. **1**.

FIG. **4** is a longitudinal cross section of the rotor chamber and rotor body only, of FIG. **1**, showing the first radially outer inlet ports and second centrally positioned inlet port means;

FIG. **5** is an exploded perspective view of a second embodiment of rotor body and chamber therefor;

FIG. **6** is a longitudinal cross section of the assembled rotor body and chamber of FIG. **5**.

FIG. **6***a* is a transverse cross section taken along the line **6***a*—**6***a* of FIG. **6**.

FIG. **7** is a longitudinal cross section of a third embodiment of rotor body;

FIG. **8** is an end elevational view of FIG. **7**.

FIG. **9** is a longitudinal cross section of a fourth embodiment of my invention;

FIG. **10** is a fragmentary view, in perspective, showing a cap detail of the rotor chamber;

FIG. **11** is a longitudinal cross section of a directionally static, manually adustable valve utilizing the same valve body as shown in FIG. **1**;

FIG. **12** is an exploded, perspective, partially sectional view of a fifth embodiment of my invention;

FIG. **13** is a partial, longitudinal cross-section of the assembled unit of FIG. **12**;

FIG. **14** is a transverse cross-section taken along line **14**—**14** of FIG. **13**;

FIG. **15** is an end view taken along line **15**—**15** of FIG. **13**;

FIG. **16** shows in an exploded, side elevational fragmentary view, of several components of the fifth embodiment shown in FIGS. **12-15**;

FIG. **17** is an assembled longitudinal cross-section of the components of FIG. **16**;

FIG. **18** is an exploded, perspective, partially sectional view of a sixth, and presently preferred, embodiment of my invention;

FIG. **19** is a fragmentary, longitudinal cross-section of the unit shown in FIG. **18** after the assembly thereof;

FIG. 20 is a transverse cross-section taken along line 20—20 of FIG. 19; and

FIG. 21 is a transverse cross-section taken along line 21—21 of FIG. 20.

DETAILED DESCRIPTION OF THE INVENTION

The fluid valve of this invention, as shown in FIGS. 1–4, is designated generally by the numeral **10** and comprises, generally, an elongated valve body **12**, a rotor chamber **50** coaxially mounted within the valve body **12**, and a rotor body **80** mounted within the rotor chamber **50**.

The valve body **12** is provided with a first fluid inlet means **16** having a transversely aligned fluid bore **15** adapted to be sealingly connected to a fluid (water) inlet pipe denoted in phantom line **17**. The fluid bore **15** of first fluid inlet means **16** opens into a generally cylindrical intermediate valve body section **19** defining an elongated cylindrical valve bore **18** having a longitudinal axis X—X. The valve body **12** is provided with a fluid outlet means **22** having a relatively enlarged bore **24** adjacent the mouth or exit end **25** thereof, the bore **24** stepping down to a smaller diameter bore **26** which bore **26** is located immediately downstream of intermediate valve body section **19**. The fluid outlet means **22** is provided with generally transversely extending air inlet means, bore **28**, opening into bore **26** of the fluid outlet means **22**, which bore **28** enables air admixture with the effluent water stream to take place as will be explained hereafter in detail. The air inlet tube connection to bore **28** is shown in phantom line **30**.

Mounted for longitudinal movement, along the longitudinal axis X—X of valve bore **18**, is the rotor chamber. The manner of its longitudinal axial movement will be described shortly hereafter.

Referring now to FIGS. **1**, **3**, **3a** and **4**, in particular, the rotor housing or chamber **50** is generally cylindrical in shape and is provided with an end wall **51** at the inlet or upstream side of chamber **50**. As best shown in FIG. **4**, the inlet end wall **51** of chamber **50** is provided with a flared central aperture or valve seat **53** and the cylindrical wall **52** of rotor chamber **50** is provided with radially outer fluid inlet ports **54**, **54a**.

The rotor body member **80** is contained, for rocking and rotational movement, within the rotor chamber **50** in the following manner. The rotor body member **80**, in the embodiment shown in FIGS. **1**, **3**, **3a** and **4** is an elongated tubular member having a rotor bore **81** extending coaxially therethrough. The tubular wall **83** of rotor body **80** is enlarged near one end thereof forming a toroidally-shaped mounting means or member **82**, projecting from the surface of the tubular rotor body wall **83** in an off-center relationship with respect to the length of the rotor body. The toroidally-shaped member **82** is seated for both limited up-down (rocking) movement and rotational movement within cylindrical bore **55** of cap member **56**, the cap member, in turn, being press-fitted into the open upstream, end of the rotor chamber **50**. As clearly shown in FIGS. **1** and **4**, the downstream end **85** of rotor body **80** extends through cap member **56**, the rotor body **80** being, however, retained (from axial downstream displacement) within cap member **56** by its radially inwardly extending annular shoulder **58**. The cap member **56**, in turn, is stably held within the downstream end of rotor chamber **50** by means such as a threaded retaining member **56a** (see FIG. **4** especially).

The rotor chamber **50**, together with the rotor body **80** assembled therein, as shown in FIG. **4** is then affixed or mounted to a generally frustro-conical adjustment, or control, knob or member **100** as follows. The control knob **100** is provided with a threaded connector end **102**, the connector end having both an internally threaded surface **103** and an externally threaded surface **104** as best seen in FIGS. **1** and **2**. The retaining member **56a** of rotor chamber **50** has a portion of its external wall **52** thereof threaded, as designated by the numeral **63**, the threaded surface **63** being threadably mounted to complementary threaded surface **103** of the control knob connector end **102**. The control knob **100**, and the rotor chamber **50** are now equivalent, in a functional sense, to a single, unitary, component. The flared control knob **100** and rotor chamber **50**, affixed thereto, are now inserted into the valve body **12** and rotated until threaded surface **104** is completely threadably engaged to the internally threaded surface **110** of valve bore **18**, as shown in FIG. **1**. In this condition, as shown in FIG. **1**, the centrally located inlet aperture, or valve set **53** of rotor chamber **50** is completely closed by a tapered valve plug **112** secured within, and along the axis of, the valve bore **18**, by means of a transversely extending strut member **113**. The strut **113** and plug **112** are preferably integrally formed with the valve body **12**.

The control knob **100** has protruding wing portions **117** to enable easy gripping thereof and easy rotation, within valve body **12**.

The flared body **120** of control knob **100** is provided with a plurality of longitudinally extending slots **122**, as shown in FIGS. **1** and **2**, the purpose of which are to enable manual compression of the mouth **124** of control knob **100** thereby enabling an annular enlargement or annular retaining bead **126**, formed on the exterior of the control knob body **120**, to move inwardly past an annular retaining shoulder **128** formed on valve body **12** just inwardly of the mouth **25**. The annular retaining bead prevents accidental displacement, in an axial direction, of the control knob **100** relative to the valve body **12**.

In the assembled condition, shown in FIG. **1**, the control knob **100** is rotatable in a counter-clockwise direction to unseat the central valve seat aperture **53** from the valve plug **112** (this position not being shown). Thus, some fluid, entering the fluid inlet means **16** may (or may not) pass through central valve seat aperture **53** of rotor chamber **50**.

It is also to be noted that the outer cylindrical wall **52** of the rotor chamber is spaced from the inner wall surface of the valve bore **18** whereby fluid not passing through central valve seat aperture **53** will pass through radially outer inlet ports **54**, **54a** of rotor chamber **50** and thence into the rotor chamber interior itself.

To further expand on the operation of the fluid valve of FIGS. 1–4, and analyzing the condition shown in FIG. **1**, all of the water entering the fluid inlet bore **15** from pipe **17** will pass through radially outer or offset inlet ports **54**, **54a** (since valve seat **112** has closed off the central inlet valve seat aperture **53**). The inlet ports **54**, **54a** are inclined so as to inject fluid onto the walls of the rotor body **80**, with a substantial tangential component of force, relative to the rotor body wall, to thereby impart a high degree of rotation of the rotor body in either the counter-clockwise direction, as shown in FIG. **3a**, by way of example, or in the clockwise direction.

As mentioned previously, the upstream side **85a** of rotor body **80** is heavier than the downstream side **85** because the fulcrum provided, by toroidal seat **82** and the bore **55** of cap member **56**, is off-center. The rotor body will thus initially assume an inclined non-axial attitude wherein the downstream side **85a** is below the upstream side **85**, as shown in FIG. **1**. As the water pressure continues to be applied, one or the other of the fluid jets from tangential inlets **54** and **54a** will displace the inlet side **85a** of rotor body **80** away from its initial attitude and into the path of the other tangential inlet of the fluid jets. This displacement repeats itself back and forth between the tangential fluid jets causing the inlet side **85a** of the rotor body **80** to toggle diametrically across the rotor chamber **50**, such that the inlet side **85a** is constantly being urged away from the longitudinal axis of the rotor chamber **50**.

The net result is that inlet side **85a** of rotor body **80** will tend to describe a generally conical surface of revolution with its apex at the fulcrum provided by toroidal surface **82**. It is clear that the outlet side **85** of rotor body **80** describes a similar but opposit trajectory about toroidal fulcrum **82**. Thus, as the rotor body **80** moves under the influence of angularly injected fluid the rotor bore **81** will be continuously angularly displaced with respect to the longitudinal axis of the cylindrical valve bore **12**; and fluid entering the rotor chamber **50** then enters, and is projected by, the moving rotor bore **81** through the valve **10** as a directional jet of continuously changing direction. Various patterns of movement of the rotor body **80** may be obtained by changing the angle at which the tangential inlets **54** and **54a** enter the rotor chamber **80**.

As the valve seat aperture **53** of chamber **50** is opened to permit more flow centrally through the chamber interior, there is less fluid flow impinging on the wall of the rotor body **80** and consequently the velocity of the outlet stream and/or the conical surface of revolution generated by the directional jet will decrease.

Air is introduced, if desired, to the directional outlet fluid jets, exiting from the outlet side **85** of rotor bore **80**. This is accomplished by aligning openings **140**, formed at the throat control knob **100**, with the air inlet means **28**. Air entering the openings **140** at the throat of the venturi formed within the flared control knob member **100** will be intimately admixed with the onrushing, exiting, continuously changing directional fluid stream. The frustro-conical bore of the venturi of control member **100** is designated by the numeral **142**.

The entire valve assembly **10**, as shown in FIG. **1** is attached to an appropriate wall, such as a whirlpool bath wall **146** by inserting the valve **10**, through an appropriately sized opening in the wall, and securing the valve **10** to the wall by means of threaded collar **148** shown in phantom, mounted to the externally threaded surface **31** of valve body **12**.

The valve components are preferably made of either metal or plastic. The valve body **12** is preferably made of brass whereas the control knob **100**, rotor chamber **50**, rotor body **80**, and cap member **56** are preferably made of low-friction tough plastic such as Lexan 141, manufactured by General Electric Company. It will be understood that other materials may be employed to fulfill the purposes of this invention.

In the FIGS. **1-4** embodiment, the rotor body **80** is mounted for both rotational and up-down rocking motion within rotor chamber **50**. The same rotor chamber **50** is also employed with a modified form of rotor body **180**, this rotor body **180** being mounted within rotor chamber **50** for substantially rotational motion only, under the influence of fluid entering the interior of rotor chamber **50** through fluid inlet ports **54**, **54a**, as best shown in FIGS. **5-6a**.

In the modification shown in FIGS. **5-6a** the rotor body **180** is generally cylindrical in nature and comprises an upstream portion **184** and a downstream portion **182** separated by a transversely extending annular collar **183**. The downstream portion **182** of rotor body **180** extends through, and is rotatable within, longitudinally extending bore **187** of cap member **185**. Collar **183** acts as a retaining member preventing axial displacement of rotor body **180** in the downstream direction.

Cap member **185**, carrying the rotor body **180** in the manner aforedescribed, is then press-fitted into the open, downstream end **57** of rotor chamber **50**, as shown in FIG. **6**, and further stably retained by threaded retainer member **185a**. The upstream portion **184** of rotor body **180** is thus wholly contained within rotor chamber **50** and is mounted therewithin for essentially rotational movement only about the longitudinal axis of the rotor chamber **50** and about the longitudinal axis X—X of valve bore **18** when rotor chamber **50** is mounted within valve bore **12** as shown in FIG. **1**.

The exterior wall of upstream portion **184** of rotor body **180** is provided with a plurality of upstanding, longitudinally extending, flange members **193**. As best shown in FIG. **6a**, fluid entering inclined radially outer inlet ports **54**, **54a** enters the annular space **194** between the rotor body **180** and the interior wall **52a** of rotor chamber **50**, and thereby exerts pressure in a counterclockwise direction, on the flange members **193**. Rotation of the rotor body **180** in the direction shown, is then initiated. The fluid then proceeds, from the annulus **194** to the upstream, or inlet end **196** of rotor bore **198** and downstream through the rotating rotor bore. The rotor bore is eccentric, at least at its downstream or outlet side; the eccentric bore (being designated by the numeral **198a**) will, when rotor body **180** is rotated, describe a conical surface or revolution, and the fluid stream exiting therefrom, will follow an effluent path of continuously changing direction along a conical path of revolution.

Inasmuch as the rotor chamber **50** and cap member **185** is essentially of the same configuration as in FIG. **1**, the means for dividing or adjusting fluid flow between central valve seat aperture **53** and radially outer ports **54**, **54a** and thereby regulating the velocity of the directional fluid jet emanating from rotor bore **198a**, the means of external control and the means of air-water admixing are essentially the same as described with the FIG. **1**.

Another embodiment of my invention is shown in FIGS. **7** and **8**. In this embodiment, the rotor body **200** has, as in FIGS. **5-6a**, an upstream portion **202** and a downstream portion **204** separated by a transversely extending collar member **206**. The upstream portion **202** is provided with upstanding paddle members **207**. The rotor body **200** is mounted for essentially pure rotational motion, in a manner described with reference to rotor body **180** of FIGS. **5-6a**. The bore **210** of rotor body **200** however is not eccentric but is parallel to, but the radially offset from, the longitudinal axis X—X of valve bore **18**. The effluent path of fluid flow from bore **210** traces a continuously changing directional stream forming an annular surface of revolution.

FIGS. 9 (and 10) depicts a further modified embodiment of my invention wherein the rotor chamber **250** and external control knob **260** components are cast or molded as an integral unit. FIG. **10** shows a perspective view of rotor chamber **250** and plug **257**. The rotor body **80'** is mounted, for rocking and rotational motion, within the rotor chamber **250**, by means of toroidal plug **82**, in a manner similar to that shown in FIGS. **1-4**. The rotor chamber **250** then has its upstream end **252** closed off by centrally apertured plug **257** since the rotor body **80'** must be first inserted, within the rotor chamber **250**, through the upstream end **252**.

The unitary rotor chamber **250** and control knob **260**, together with the rotor body **80'**, is threadably mounted into valve body **212**, the engaging threadable surfaces being indicated generally by the numerals **270**, in FIGS. **9** and **10**. In FIG. **9**, the control knob **260** is shown in its most downstream position wherein the control aperture **255** of plug **257** is completely open—so that little, if any fluid flow will enter the rotor chamber **250** through radially outer ports **254**. As the control knob **260** is rotated to a more upstream position, the control aperture **255** is closed off to a greater and greater degree. The manner of adjustment of fluid flow through the central inlet aperture **255** and the radially outer inlet ports (not shown), is essentially the same as that heretofore described within reference to FIGS. **1-4**.

The valve body **300**, as shown in FIG. **11**, is essentially of the same configuration as that shown in FIG. **1**, and is utilized as a valve body for the other types of valves as well, as will be shown.

The valve body **300** has a fluid inlet bore or means **297**, a centrall located, integral valve plug **301** in the inlet or upstream side, a generally cylindrical valve bore **303** immediately downstream of plug **301**, a transverse air inlet bore or means **309** communicating with the valve bore just downstream of the threaded surface area **305**, and an enlarged valve bore **311** at the downstream end of the valve body **300**. The valve body **300**, as described, is designed to contain not only the components of the valve of the instant invention, but is designed so as to contain the internal components of a manually adjustable directional jet stream, of the type described in my U.S. Pat. No. 4,221,336. Thus, a spring member **302**, inner and outer bearing members **304**, **306** and manually rotatable discharge ball or nozzle **308** is contained within enlarged downstream valve bore **311**, and a fluid flow restrictor **315** is threadably mounted to threaded surface **305** just upstream of the air inlet means **309** in order to create an intimate air-water admixture as the water exits from the restrictor **315** and enters the enlarged downstream bore section **311**. The valve body configuration of this invention thus can be seen to have multiple uses.

Referring now to the embodiment of FIGS. **12-15**, the fluid valve is designated generally by the numeral **400** and comprises, generally, an elongated valve body **412**, a rotor chamber **450** coaxially mounted within the valve body **412** and a rotor body **480** mounted within the rotor chamber **450**.

The rotor body **480** is provided with a rotor bore **481**, a downstream portion of which, **481***a* is radially offset; the rotor body **480** is also provided with a plurality of external, generally radially projecting fins or paddle members **482** at its downstream end. Near the upstream end of the rotor body **480**, a plurality of ball-bearings contained within races in a conventional manner, and designated generally by the numeral **485**, is provided. The inlet to the rotor bore **481** (designated **481***b*), is enlarged and communicates directly with the main fluid stream entering the first fluid inlet means **416** of valve body **412**. .

The rotor chamber **450** is shown as being integrally affixed (e.g., molded or casted) to a control means or knob **490** as best shown in FIGS. **12** and **13**. It will be understood however that the rotor chamber may be a separate component from that of the control means or knob **490** and may be threadably engaged or otherwise connected thereto through various forms of mechanical linkage. The control means **490** has an externally threaded intermediate section **492** provided therein for threadable engagement thereof within the valve bore **418**, as will be seen. Moreover, as best shown in FIGS. **16** and **17** a separate, externally threaded shroud control ring **493** slideably interfits onto connector knob **490**, immediately adjacent threaded section **492**, the split threads A and A' of sections **492** and **493** abutting each other as best shown in FIGS. **16** and **17**. The purpose of shroud control ring **493** will be explained hereafter.

To assemble the fluid valve components, the rotor body **480** is press-fitted onto the rotor chamber end of the control knob **490**, as shown in FIG. **13**, the press-fit occurring between the external surface of the ball-bearing means **485** and the upstream end of the internal wall of the rotor chamber **480**. The control knob **490** and rotor body **480**, assembled thereto, is then threadably mounted within the valve bore **418** of the valve body **412** by means of the engagement of external threaded sections **492** and externally threaded control ring **493** of control knob **490**, with the internally threaded section **494** of the valve body **412**. In the position shown in FIG. **13**, the control knob **490** has been threadably mounted, within valve bore **418**, to its most upstream point, at which point inclined radially offset inlet port means **496** are fully open to an annular clearance or space **498** provided between the valve bore **418** and the rotor chamber **450**. Thus, as fluid enters the first fluid inlet means **416**, a small portion thereof will move into and through annular space **498**, thence through inclined radially offset inlet ports **496** and be directed onto fins or paddle members **482**, and from there passing through the annular space **483** surrounding the downstream end of the rotor body **480** into an intermediate portion of **487** of the control knob **490**. The flow of the water from fluid inlet **416** to intermediate portion **487** is denoted by arrows W_1. The rotor body **480**, being mounted for rotation, in a relatively friction-free or free-running mode by means of its ball-bearing mounting **485**, immediately commences to rotate whereby the main portion of the fluid W passing through the rotor bore **481** and into offset portion **481***a* will travel, in a generally annular, cone-shaped pattern, downstream along the flared outlet end portion **500** of control knob **490**, to be directed, in that fashion, onto the user whether it be in a whirlpool bath or in a shower, or other uses. Of course, if the environment is a whirlpool bath, air entering the fluid stream, via lateral ports **502**, **504** of valve body **412** and control knob **490**, respectively, may be admixed with the water as it travels along the flared section **500** of the control knob.

For any given level of water pressure, this invention provides a simple and reliable means for altering the rotation of the rotor body **480** from a speed of rotation of as high as 4000 rpm to an rpm level of as low as 100 rpm. This is readily accomplished by unscrewing the control knob **490** (i.e., turning it counter-clockwise as viewed in the FIG. **13** position). As this unthreading of the control knob **490** occurs, the inclined radially offset ports **496** are moved to the right in FIG. **13** and may be partially closed by the shroud control ring **493** (which remains threadably engaged to the valve bore **418** and stationary because it is a separate and discrete component from the control knob **490**), the degree of closure depending upon the degree of unthreading of the control knob **490**. If the radially offset ports **496** are further moved to the right in FIG. **13**, the ports **496** will be completely closed off by the shroud control ring **493**; no fluid pressure will be exerted on the rotor body **480** and no rotational movement will result.

The following points are to be especially noted with respect to the FIGS. **12–17** embodiment. First, it is to be noted that the ball-bearing means **485** is encased within an annular cavity or groove **489** of the rotor body **480** and the ball-bearings are located upstream of the paddles **482**, to which water stream W_1 is directed for rotational movement of the paddles. Because the ball-bearings **485** are located upstream of the rotational stream W_1 to the rotor paddles **482** and are protected by the upstream wall **499** of the rotor body, from the main mass of fluid flow W, the total fluid flow essentially completely bypasses the bearing means **485**. Therefore, any particles, dirt, hair and the like in the fluid will bypass the ball-bearings, not deleteriously affect the performance of the bearings, and will result in a more controllable, predictable, rotation. By contrast, in the FIGS. **1–4** embodiment, the bearing surfaces of the rotor body **80** are located downstream of the rotationally directing fluid stream and there is sometimes a tendency for the rotor body to not be as free-running due to the location of the rotor body with respect to the impacting rotationally directing stream. Furthermore, the impurities in the fluid stream may become enmeshed by the rotor body **80**, and bearings thereof of the FIGS. **1–4** embodiment.

In the FIGS. **12–17** embodiment, a maximum flow of water is made available for entry into rotor bore inlet **481***a* because no centrally located valve seat **112** is necessary as in the FIGS. **1–4** embodiment. Where a valve seat is present, an obstruction to the main fluid flow and a vortex is produced within the rotor bore. Both of these conditions are undesirable in effecting maximum fluid flow through rotor bore **481**. In the FIGS. **12–17** embodiment, the minimum necessary diversion of directing stream W_1 may be calculated (and annular spacing **498** and dimensions of offset ports **496** calculated) with the remaining fluid stream W flowing through rotor bore **481** to the maximum possible extent—in an unimpeded manner.

The FIGS. **12–17** embodiment can be modified to have a rotor bore radially offset from its longitudinal axis, as shown in FIG. **7**, or may be otherwise placed in the rotor body in order to alter the effluent path of fluid.

It is to be further noted that the fluid valve of the invention may be utilized solely as an air or gas valve, solely as a water or liquid valve, or as a gas-liquid (e.g. air-water admixture) valve.

The presently preferred embodiment of this invention is shown in FIGS. **18–21**.

The FIGS. **18–21** embodiment is presently preferred for a number of reasons. In addition to the advantages heretofore enumerated with respect to the next previous embodiment, this embodiment provides the following advantages: (1) a more completely sealed ball-bearing mounting for rotor body **680** so as to minimize solid contaminants in the water stream which might otherwise foul the ball bearings **685** and the rotational movement of the rotor body (**680**); (2) the advantage of almost 100% flow of the water stream through the rotor bore of the rotor body, such maximum flow minimizing problems of contamination due to fluctuations in flow; (3) the effluent air-water stream can be readily made to follow various rotational effluent paths—specifically, not only that of one direction (e.g., clockwise), but that of a reverse direction (i.e. counterclockwise); and further, the rotational stream can be readily by-passed altogether if not desired.

The construction of the FIGS. **18–21** embodiment will now be set forth with special attention to the differences over the earlier embodiments herein described.

In FIGS. **18–21**, the fluid nozzle or valve is designated generally by the numeral **600** and preferably comprises, generally, an elongated valve body **612**, an external control knob **690**, provided at its upstream end with a rotor chamber **650** and a control ring **693**, all coaxially mounted within the valve body **612**, the rotor chamber **650** partly enclosing a rotor body **680**, the control means or ring **693** mounted at the upstream end of the rotor chamber **650** cooperating with the control knob means **690** to vary the effluent pattern of the rotary fluid stream, as will be described.

Referring to FIG. **19**, the rotor body **680** is provided with a rotor bore **681**, a downstream portion of which, **681***a*, is radially offset; the rotor body **680** is also provided with a plurality of external, generally radially projecting fins or paddle members **682** at its downstream end. Near the upstream end of the rotor body **680**, a plurality of ball-bearings **613**, contained within races in a conventional manner and designated generally by the numeral **685**, are provided. The inlet to the rotor bore **681** (designated **681***b*), is enlarged with respect to the bore **681** and communicates directly with the main fluid stream W entering the first fluid inlet means **616** of valve body **612**.

The rotor chamber **650** is shown as being integrally affixed (e.g., molded or casted) to a control means or knob **690** as best shown in FIGS. **18** and **19**. It will be understood however that the rotor chamber may be a completely separate component from that of the control means or knob **690** and may be threadably engaged or otherwise connected thereto through various forms of mechanical linkage. The control means **690** has an externally threaded intermediate section **692** provided therein for threadable engagement thereof within the valve bore **618**. Moreover, as best shown in FIGS. **18** and **19** a separate, externally threaded shroud control ring **693** slideably interfits onto the upstream end of control knob **690**, immediately adjacent threaded section **692**, the split threads A and A′ of sections **692** and **693** abutting each other as best shown in FIG. **18**. The purpose of shroud control ring **693** will be explained hereafter.

To assemble the fluid valve components of this embodiment, the rotor body **680** is press-fitted onto the rotor chamber end of the control knob **690**, as shown in FIG. **19**, the press-fit occurring between a portion of the external surface **686** of the ball-bearing means **685** and the upstream end of the internal wall of the rotor chamber **680**. The control knob **690** and rotor body **680**, assembled thereto, is then threadably mounted within the valve bore **618** of the valve body **612** by means of the engagement of external threaded sections **692** and externally threaded control ring **693** of control knob

690, with the internally threaded section 694 of the valve body 612.

In the position shown in FIG. 19, the control knob 690 has been threadably mounted, within valve bore 618, to its most upstream point, and the control means or ring 693 abuts the adjacent threaded section 692 with the split threads A and A^1 of sections 692, 693 abutting each other as shown in FIG. 18. In this position, inclined radially offset inlet port means 696 are fully open to an annular clearance or space 698 provided between the valve bore 618 and the rotor chamber 650. Also, in the position shown in FIG. 19, a second substantially larger inlet port 696*a*, e.g., of approximately twice the volume of inlet port 696, and which is slightly downstream of inlet port 696, and inclined in the opposite direction to port 696, as shown in FIG. 20, is also completely open so that approximately twice as much water enters larger port 696*a* than does port 696.

Thus, as fluid enters the first fluid inlet means 616, a small portion thereof (e.g., 5% of total fluid flow, W_2) will move into and through annular space 698, thence through the oppositely inclined radially offset inlet ports 696, 696*a* and be directed onto the fins or paddle members 682. The greater fluid flow through port 696*a* will cause clockwise rotation of the paddle members 682. The water stream W_2 then passes through the annular space 683 surrounding the downstream end of the rotor body 680 into an intermediate portion 687 (containing air ports 704) of the control knob 690.

The rotor body 680, being mounted for rotation, in a relatively friction-free or free-running mode by means of its ball-bearing mounting 685, will immediately commence to rotate, under the influence of side-entering water stream W_2, whereby the main portion of the fluid W (e.g., 95% of the total) passing through the rotor bore 681 and into offset portion 681*a* will travel, in a generally annular, cone-shaped pattern, downstream along the flared outlet end portion 700 of control knob 690, to be directed, in that fashion, onto the user whether it be in a whirlpool bath, in a shower, or in other environments or uses.

It will be noted that the larger inlet port 696*a* is inclined so that the resultant stream W_2 will force paddle wheels 682 of rotor body 680 clockwise. By unthreading control knob 690 (turning knob 690 counterclockwise), side inlet port 696*a* is partially blocked off by stationary shroud control ring 693 and side inlet port 696 remains open whereby fluid stream W_2 enter both ports 696, 696*a* in opposite directions but can be readily balanced against each other to stall the rotation of rotor body 680. As further unthreading of the control knob 690 takes place, inlet port 696*a* is more fully blocked, and stream W_2 entering side inlet port 696 will be greater than the force of stream W_2 entering port 696*a*, and cause a flow reversal from clockwise to a counterclockwise rotation. The user can sense the directional change in water flow, and such a change is deemed desirable.

If the environment is a whirlpool path, air entering the fluid stream, via lateral ports 702, 704 of valve body 612 and control knob 690, respectively, may be admixed with the water as it travels along the flared section 700 of the control knob.

The following points are to be noted with respect to the FIGS. 18–21 embodiment. Firstly, there is no central plug in valve inlet means 616 and the clearance 698 between valve body 612 and the upstream end of rotor chamber 680 is such that approximately 5% of the total flow of water into the valve 600 moves along clearance 698 and the remaining approximately 95% moves through rotor bores 681, 681*a* to achieve a maximum effluent rotary stream.

Secondly, the ball-bearing means 685 are upstream of the inlet port 693 and are essentially completely concealed from the stream W_1. The direction of the main stream is also removed from the ball bearings 685, so that contaminants in the water streams W and W_2 will not foul the ball-bearings. The operability and reliability of the fluid valve 600 is thereby maximized.

Thirdly, because the side inlet ports 696 and 696*a* are not axially aligned, they can be selectively counterbalanced against each other. In this way, clockwise or counterclockwise effluent streams can be achieved, or even a complete by-pass of a rotational effluent stream, if desired.

Fourthly, it will be noted that in the position shown in FIG. 19, the side inlet port 696*a* is removed from the exit port 710 almost 360°. Because of this approximately 360° separation between inlet and outlet, the entering water stream W_2 through inlet 696*a* exerts maximum efficiency in turning paddles 682 of rotor body 680. An approximate 180° separation between inlet and outlet exists when side port 696 is the only open port.

It is to be further noted that external operation of the shroud control ring is not necessary. Thus, for example, if only the rotor chamber 650 and threaded ssections 692 and shroud ring 693 portion comprised the control means, the relative movement of the rotor chamber 650, (and its ports 696, 696*a*) with respect to stationary shroud control ring 693 could be made by inserting a screwdriver type element into valve body 612 to engage complementary slots 720 (formed adjacent the threads 692 and shown in phantom in FIG. 19).

It should also be noted that the shroud control ring 693 need not be a separate ring means from that of the valve body 612 but could quite readily be machined into, and as an integral part of, valve body 612. Such an integral shroud control ring will, preferably, have a split ring A^1, in order to rotationally align and position the rotor chamber 650 by the abutment of split thread A with split thread A^1 as described heretofore.

It should also be noted that it is the relative displacement of the shroud ring 693 and rotor chamber 650 that is important in achieving precise control; this means that the shroud ring 693 could be made moveable along the axis of the valve bore 618 and the rotor chamber be held stationary in the valve bore.

As with the FIGS. 12–17 embodiment, for any practical level of water pressure, this embodiment provides a simple and reliable means for altering the rotation of the rotor body 680 from a speed of rotation of as high as 4000 rpm to an rpm level of as low as 100 rpm.

In summary, the applicant has achieved the following:

(a) a simple and reliable means for continuously changing the effluent pattern of a water stream or a water-air stream, e.g., the effluent stream describing the path of an annular or cone-shaped discharge, the effluent pattern being determined by the nature of the rotor bore provided in the rotor body; and, in combination with (a)

(b) a simple and reliable means for varying the rate of revolution of the rotor body at any particular level of water pressure.

It will appreciated by those skilled in the art that many changes, modifications and substitutions are possible without departing from the spirit and scope of the invention. Therefore, applicant intends to be bound only by the scope of the appended claims.

I claim:

1. A fluid valve for discharging a directional outlet fluid stream of continuously changing direction comprising:

a valve body having a first fluid inlet means and having a valve bore therethrough, said valve bore having a longitudinal axis and a fluid outlet means;

an elongated rotor body mounted within said valve bore and having a rotor bore passing therethrough, said rotor body being mounted for movement within said valve bore to enable displacement of said rotor bore with respect to said longitudinal axis of said valve bore, said rotor bore having a rotor bore inlet and rotor bore outlet, said rotor bore inlet beng in fluid communication with said first fluid inlet means and said rotor bore outlet having its outer end communicating with said fluid means of said valve body; and

a rotor chamber having fluid inlet port means in communication with said first fluid inlet means, said fluid inlet port means of said rotor chamber being radially offset with respect to said longitudinal axis of said valve bore, and said radially offset fluid inlet port means of said rotor chamber being in communication with said rotor body whereby at least a portion of fluid entering said first fluid inlet means initially passes into said radially offset fluid inlet port means of said rotor chamber and thence exerts external force on said rotor body to cause movement of said rotor body and displacement of said rotor bore with respect to said longitudinal axis of said valve bore, and whereby fluid also passes through said rotor bore inlet into said rotor bore, and into said fluid outlet means of said valve body, as a directional outlet stream of predetermined continuously changing direction, as determined by the displacement of said rotor bore; and

positioning means for adjustably positioning said rotor chamber along the direction of the longitudinal axis of said valve bore whereby to adjust the rate of movement of said rotor body by increasing or decreasing the amount of fluid entering said first fluid inlet means and conversely decreasing or inceasing the amount of fluid entering said radially offset fluid inlet port means of said rotor chamber.

2. The fluid valve of claim 1 wherein said rotor body is mounted for continuous up-down movement under the influence of external fluid force on said rotor body.

3. The fluid valve of claim 2 wherein said rotor bore is concentric with said rotor body, and said directional outlet stream describes a generally conical surface of revolution.

4. The fluid valve of claim 1 wherein said rotor body is mounted for both rocking and rotational movement under the influence of external fluid force on said rotor body.

5. The fluid valve of claim 4 wherein said rotor bore is concentric with said rotor body, and said directional outlet stream describes a generally conical surface of revolution.

6. The fluid valve of claims 1 wherein said rotor body is mounted for essential rotary movement under the influence of external fluid force on said rotor body.

7. The fluid valve of claim 1 wherein said rotor body is mounted for essentially rotary movement under the influence of external fluid force on said rotor body and said rotor bore is parallel to, but radially offset from, said longitudinal axis of said valve bore.

8. The fluid valve of claim 1 wherein said positioning means for adjustably positioning said rotor chamber comprises an external control knob, a control knob body extending inwardly within said valve bore, and a connector end, affixed to the inner end of said knob body, for connection to said rotor chamber and movment thereof along the longitudinal axis of said valve bore.

9. The fluid valve of claim 8 wherein said control knob body is of generally frustro-conical shape.

10. The fluid valve of claim 8 wherein said connector end threadably engages said rotor chamber for movement thereof along the said longitudinal axis of said valve bore.

11. The fluid valve of claim 8 wherein said rotor chamber is integrally connected to said inner end of said knob body.

12. The fluid valve of claim 11 wherein said rotor chamber threadably engages said valve body for movement of said rotor chamber along the longitudinal axis of said valve bore of said valve body.

13. The fluid valve of claim 1 wherein said rotor chamber is integrally connected to an elongated control member, said control member extending through the said valve bore to the exterior of the outlet side of said valve bore.

14. The fluid valve of claim 1 wherein said rotor body is mounted for essentially rotary movement under the influence of external fluid force on said rotor body and said motor bore is a least partially eccentric with respect to said longitudinal axis of said valve bore.

15. The valve of claim 1 wherein said radially offset fluid inlet port means of said rotor chamber is inclined for injection of fluid tangentially onto said rotor body thereby creating a tangential force within said rotor chamber for moving said rotor body.

16. The fluid valve of claim 15 wherein said rotor body is provided with a toroidal surface for mounting in a seat formed in said rotor chamber, said toroidal mounting providing a fulcrum for both rocking and rotational movement of said rotor body under the influence of said angularly injected fluid.

17. The fluid valve of claim 15 wherein said rotor body is tubular and is provided with an off-center fulcrum axis whereby to provide both rocking and rotational movement of said rotor body under the influence of said angularly injected fluid.

18. The fluid valve of claim 1 wherein said rotor body has externally mounted thereto a plurality of generally radially extending fins and wherein said fluid entering said radially offset fluid inlet means of said rotor chamber engages said fins to thereby exert external force on said rotor body and to cause movement thereof.

19. The fluid valve of claim 1 wherein means is provided for longitudinally displacing said radially offset fluid inlet port means of said rotor chamber from a first position to a second position to thereby alter the amount of fluid flow entering said radially offset fluid inlet port means.

20. The fluid valve of claim 19 wherein said means for longitudinally displacing said radially offset fluid inlet port means of said rotor chamber comprises means for displacing said rotor chamber containing said radially offset fluid inlet port means, from a first position in said valve bore, wherein said radially offset port means is

fully open, to a multiplicity of intermediate positions wherein said radially offset port means is only partially open, and to a third position wherein said radially offset port means is closed.

21. The fluid valve of claim **19** wherein said radially offset fluid inlet port means are in transverse alignment.

22. The fluid valve of claim **19** wherein at least a first one of said radially offset fluid inlet port means is provided upstream with respect to a second of said radially offset fluid inlet port means, and said first inlet port means is inclined in one direction and said second inlet port means is inclined in a different direction whereby fluid entering said first and second port means act counter to each other.

23. The fluid valve of claim **22** wherein said first one of said radially offset fluid inlet port means is substantially larger than a second of said radially offset fluid inlet port means.

24. The fluid valve of claim **19** wherein said means for longitudinally displacing said radially offset fluid inlet port means of said rotor chamber comprises means for displacing said rotor chamber containing said radially offset fluid inlet port means, from a first position in said valve bore, wherein said radially offset port means is fully open, to a multiplicity of intermediate positions wherein said radially offset port means is only partially open.

25. The fluid valve of claim **1** wherein said rotor body is mounted, for essentially rotary movement under the influence of external fluid force on said rotor body, proximate to the downstream end of said rotor body.

26. The fluid valve of claim **1** wherein said rotor body is mounted, for essentially rotary movement under the influence of external fluid force on said rotor body, proximate to the upstream end of said rotor body.

27. The fluid valve of claim **1** wherein said rotor body is mounted onto said rotary chamber by ball-bearing means, for essentially rotary movement under the influence of external fluid force on said rotor body.

28. The fluid valve of claim **27** wherein said ball-bearing means are encased, on its upstream side, by a wall of said rotor body whereby said ball-bearing means are shielded from fluid flow passing through said rotor bore inlet.

29. The fluid valve of claim **1** wherein said positioning means for adjustably positioning said rotor chamber is located internally of said valve body.

30. The fluid valve of claim **1** wherein said positioning means for adjustably positioning said rotor chamber is a slot means located internally of said valve body.

31. The fluid valve of claim **1** wherein said rotor body is provided with fin members whereby said fluid passing into said radially offset fluid inlet port means exerts force on said fin members to cause movement of said rotor body.

32. The fluid valve of claim **1** wherein said rotor body is provided with fin members whereby said fluid passing into said radially offset fluid inlet port means exerts force on said fin members to cause rotary movement of said rotor body.

33. The fluid valve of claim **1** wherein said rotor body is mounted, for essentially rotary movement under the influence of external fluid force on said rotor body, proximate to the downstream end of said rotor body.

34. The fluid valve of claim **1** wherein said rotor body is mounted, for essentially rotary movement under the influence of external fluid force on said rotor body, proximate to the upstream end of said rotor body.

35. The fluid valve of claim **1** wherein said rotor body is mounted onto said rotary body by ball-bearing means, for essentially rotary movement under the influence of external fluid force on said rotor body.

36. The combination of a valve body for a fluid nozzle with a control means for adjusting the effluent fluid flow pattern which comprises:

- a valve body for a fluid valve having a first fluid inlet means, said valve body defining a valve bore immediately downstream of said first fluid inlet means,
- a rotor chamber mounted for axial movement within said valve bore and defining radially offset fluid inlet aperture means for fluid communication with said first fluid inlet means,
- a rotor body defining a rotor bore mounted for rotary movement, within said valve bore, said rotor body being in fluid communication with said radially offset fluid inlet aperture means, and said rotor bore being in fluid communication with said first fluid inlet means,
- said control means including a shroud ring provided in said valve bore, and positioned to overly and block at least a portion of said radially offset fluid inlet aperture means in any of a series of positions of said axially moveable rotor chamber, and further positioned to permit unrestricted flow to said radially offset fluid inlet aperture means in a second position of said axially moveable rotor chamber, whereby fluid passes from said first fluid inlet means to both said rotor bore and to said radially offset fluid inlet aperture means in varying ratios depending upon the axial positioning of said rotor chamber, said varying ratios determining the extent of the directional forces impinging on said rotor body to thereby adjust the pattern of effluent fluid flow through said rotor bore, and
- a fluid outlet means in fluid communication with said rotor bore.

37. The combination of claim **36** wherein air inlet ports are provided to said valve bore between said first fluid inlet means and said fluid outlet means.

38. The combination of claim **36** wherein said valve bore is provided with an internally threaded surface portion, and said rotor chamber is threadably engaged with said internally threaded surface portion of axial movement relative to said shroud ring.

39. The combination of claim **36** wherein said rotor chamber is axially moveable by said control means having a handle portion thereof, located externally of said valve body.

40. The combination of claim **36** wherein said rotor chamber is axially moveable by said control means having an adjustment means located internally of said valve body.

41. The combination of claim **36** wherein said rotor body is provided with fin members whereby said fluid passing into said radially offset fluid inlet aperture means exerts force on said fin members to cause rotary movement of said rotor body.

42. The combination of claim **36** wherein said shroud ring is a separate member from that of said valve body.

43. The combination of claim **36** wherein said shroud ring is integral with said valve body.

44. The combination of claim **36** wherein said radially offset fluid inlet pressure means comprises a plurality of port means in transverse alignment with each other.

45. The combination of claim **36** wherein said radially offset fluid inlet aperture means comprises a plurality of port means transversely offset with respect to each other.

46. The combination of claim 38 wherein said radially offset fluid inlet aperture means comprises a plurality of port means transversely offset with respect to each other and said port means are inclined in opposed directions.

47. The combination of claim 38 wherein said radially offset fluid inlet aperture means comprises a plurality of port means transversely offset with respect to each other, one of said port means is substantially larger than the other port means and said one of said port means is inclined in an opposed direction to that of said other port means.

48. The combination of claim 38 wherein said shroud ring is annular and terminates in a split thread.

49. The combination of claim 36 wherein said shroud ring is annular and terminates in a split thread, and said rotor chamber has at least a portion thereof externally threaded and threadably engageable with an internally threaded surface portion of said valve bore, said externally threaded portion of said rotor chamber terminating at its upstream end in a split thread whereby abutment of said split thread of said rotor chamber with the split thread of said shroud ring precisely positions said rotor chamber and said radially offset fluid inlet aperture means with respect to said shroud ring.

50. A fluid valve for discharging a directional outlet fluid stream of continuously changing direction comprising:

a valve body having a first fluid inlet means and having a valve bore therethrough, said valve bore having a longitudinal axis and a fluid outlet means;

an elongated rotor body mounted within said valve bore and having a rotor bore passing therethrough, said rotor body being mounted for movement within said valve bore to enable displacement of said rotor bore with respect to said longitudinal axis of said valve bore, said rotor bore having a rotor bore inlet and rotor bore outlet, said rotor bore inlet beng in fluid communication with said first fluid inlet means and said rotor bore outlet having its outer end communicating with said fluid means of said valve body; and

a rotor chamber having fluid inlet port means in communication with said first fluid inlet means, said fluid inlet port means of said rotor chamber being radially offset with respect to said longitudinal axis of said valve bore, and said radially offset fluid inlet port means of said rotor chamber being in communication with said rotor body whereby at least a portion of fluid entering said first fluid inlet means initially passes into said radially offset fluid inlet port means of said rotor chamber and thence exerts external force on said rotor body to cause movement of said rotor body and displacement of said rotor bore with respect to said longitudinal axis of said valve bore, and whereby fluid also passes through said rotor bore inlet into said rotor bore, and into said fluid outlet means of said valve body, as a directional outlet stream of predetermined continuously changing direction, as determined by the displacement of said rotor bore; and

said rotor chamber being provided with a control means to adjust the rate of movement of said rotor body by increasing or decreasing the amount of fluid entering said first fluid inlet means and conversely decreasing or increasing the amount of fluid entering said radially offset fluid inlet port means of said rotor chamber.

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